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NAS SAUFLEY FIELD
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INTERIM CONCEPTUAL SITE MODEL DELIVERABLE FOR MUNITION RESPONSE SITES
NAS SAUFLEY FIELD FL
7/1/2008
MALCOLM PIRNIE, INC.

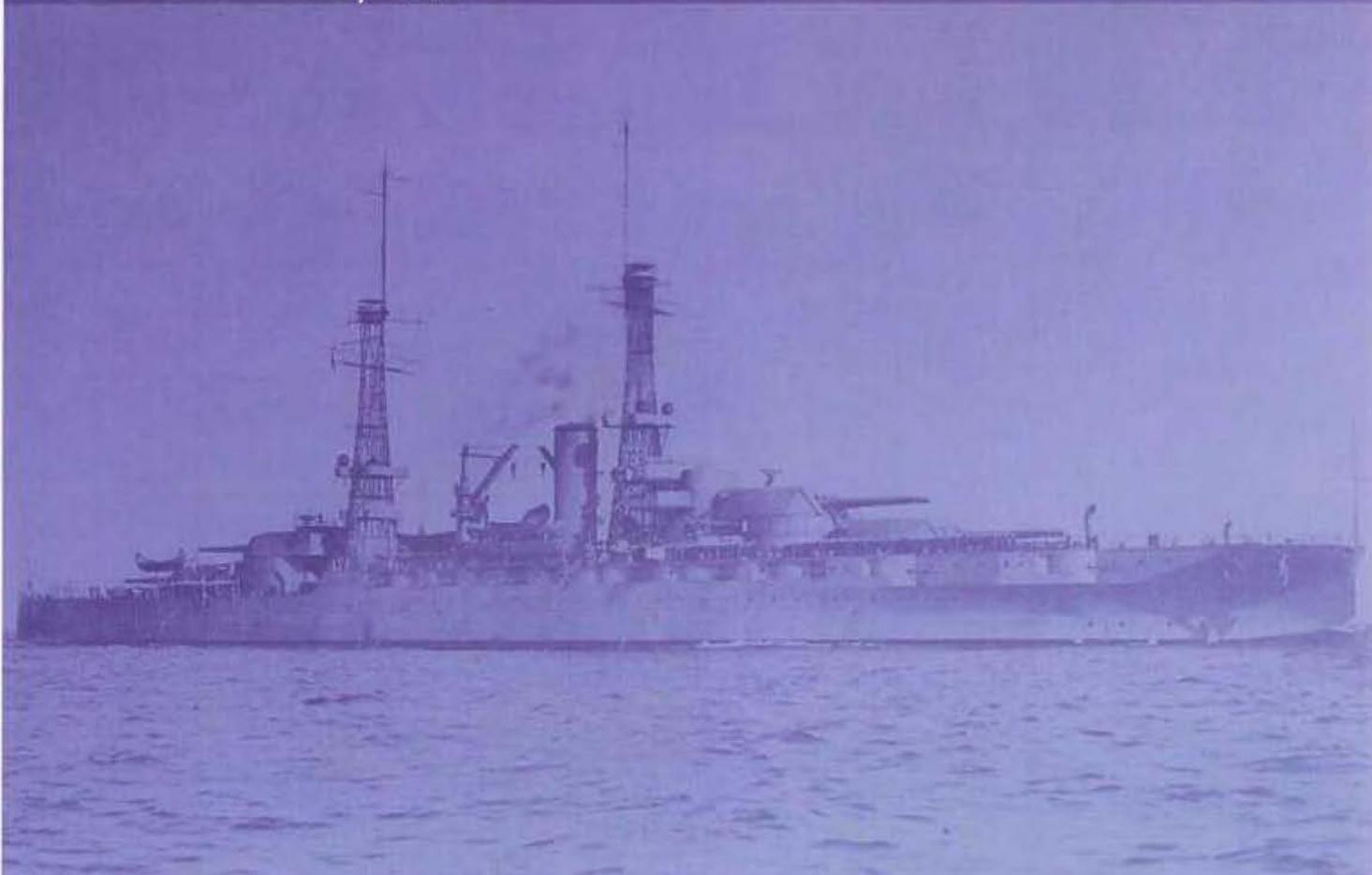
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Interim Conceptual Site Model Deliverable Naval Air Station Pensacola, Florida

**MALCOLM
PIRNIE**

July 2008



INTERIM CONCEPTUAL SITE MODEL DELIVERABLE
NAVAL AIR STATION PENSACOLA, FLORIDA

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Preliminary Assessment
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Preface

This interim deliverable provides the Navy with a summary of information collected to date and the data sources used to support the Conceptual Site Model (CSM). It summarizes our current understanding of the site, presented in the attached Information Profiles. It also provides draft Graphical Presentations of the site layout and CSM. The Information Profiles and the Graphical Presentations will serve as the basis of the CSM section of the Preliminary Assessment (PA) Report.

This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. Bayou Grande intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center; Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

Saufley Field is a 657-acre airfield with two inactive and two active runways. It was commissioned as Saufley Field on 26 August 1940 in honor of Lieutenant Richard Caswell Saufley, designated Naval Aviator No. 14. An instrument flying school and the first primary training squadron were initially based there. The student population increased with the outbreak of World War I (WWI), and Saufley Field was consequently commissioned as Naval Auxiliary Air Station (NAAS) Saufley Field. Gunnery staffs were set up at NAAS

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Saufley Field in 1943 to give fundamental gunnery instruction to pilots. By 1945, the field was used for conducting intermediate CV specialized training in SBD aircraft. The mission of Saufley Field was revised to provide support for training squadrons VT-1 and VT-5 in 1960. NAAS Saufley was recommissioned as Naval Air Station (NAS) Saufley Field in 1968; however, the on-site training squadrons were decommissioned in late 1976, and the field was then decommissioned to Naval Outlying Field (OLF) Saufley Field. In 1979, Saufley Field was reactivated as a Naval Education and Training Program Development Technology Center (NETPDTC), and the field's name was officially changed to NETPDTC Saufley in 1996. Its current mission is to support Training Air Wings 5 and 6 and to serve as home for several Department of Defense and other U.S. Government organizations as a joint use facility. Saufley Field has four runways; two 4,000-foot runways are currently active while the two others are inactive. Three hangars providing over 34,000 square feet of hangar space and 63 buildings containing over 600,000 square feet of space are located on the airfield.



Figure 1: Aerial photograph of Saufley Field

The Saufley Field Skeet Range is located approximately 650 feet west of the northwest tip of the Saufley Field runways. The range first appears on a map of NAAS Saufley dated 30 June 1943 and is illustrated on maps dated 1946 through 1949. A skeet range house labeled "Building 852" appears south of the range on a map dated 1946, and the skeet range house is visible in aerial photographs of Saufley Field dated 1943 and 1945. Two additional structures labeled "Well and Pump House at Skeet Range" appear on maps dated 1948 and 1949. An information booklet dated 1945 describes the skeet range as two 100-foot by 100-foot areas with five stations each.

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In April through June of 1945, a specialized training syllabus was given to 962 pilots who were waiting for suitable flying weather at Saufley Field. The syllabus included training lectures in target force analysis, bombing, boresighting, and sighting. It also included a requirement for each student to fire 150 rounds of shotgun firing and 150 rounds of .38-caliber pistol firing; however, this document did not specify whether this firing occurred at the Skeet Range.

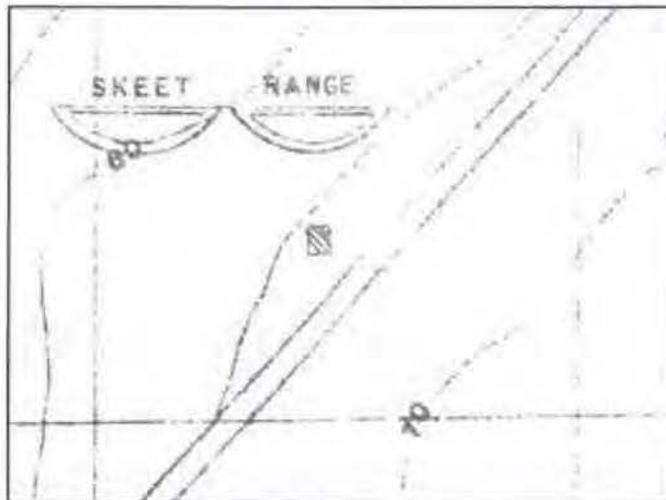


Figure 2: Skeet Range and Skeet Range House as shown on 1943 map of NAAS Saufley.

The boundary for the Skeet Range site encompasses 31.2 acres which includes the two 100-foot firing areas and the surface danger zone (SDZ) associated with the firing lines. Just southwest of the boundary lies the Saufley Field Small Arms Range. The Small Arms Range is a 1.2-acre site that was addressed during the 2007 PA of NAS Pensacola, and a portion of the Small Arms Range boundary overlaps the southwest corner of the Skeet Range boundary. According to the 2007 PA, munitions usage at the Small Arms Range likely included .38-caliber and .45-caliber pistol ammunition, as well as .22-caliber and .45-caliber rifle ammunition. No evidence of munitions debris was observed at the Small Arms Range during the 2007 PA.

A visual survey of the Saufley Field Skeet Range was conducted on 23 January 2007 during the site visit to the Saufley Field Small Arms Range for the 2007 PA of NAS Pensacola (the site visit for this PA is discussed in following sections). The Skeet Range was located in an open, grassy area which was bordered by thick brush and mature trees. The concrete foundation for the former Skeet Range House was observed, and concrete pads of five stations were observed along the western firing line. Fragments of clay targets were also observed.

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Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
- National Museum of Naval Aviation
- Historical Map Files, Building 458

Personal Interviews:

- Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department
- Mr. Jim Kane, Deputy Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Steve Ward, Real Property Management, NAVFAC SE Public Works Department Pensacola
- Commander Kristine Nielsen, Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Bill Taylor, NAVFAC SE Public Works Department Environmental
- Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE Public Works Department Pensacola
- Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc.
- Mr. Jeff Halstead, Exhibit Specialist, Fort Pickens State Park
- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park
- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

A visual survey of the Saufley Field Skeet Range was conducted on 29 November 2007 during the site visit for this PA. Malcolm Pirnie team members Ms. Susan Burnett, Ms. Angela Nolan, and Mr. Dan Hains were present. The purpose of the visual survey was to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), any evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site.

The visual survey consisted of walking the range vicinity to determine the presence/absence of MEC and MC within and along the periphery of the site. The Skeet Range was located in an open, grassy area which was bordered by thick brush and mature trees. An asphalt jogging trail was located south of the southern range boundary. The square, concrete firing pads observed during the January 2007 PA were overgrown with grass; however four firing pads were easily discernible along the western firing line in the shape of an

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arc. Three concrete building foundations were also observed south of the firing arcs, along the jogging trail. The foundations are likely the remnants of the Skeet Range House, Well House, and Pump House. No structures are located in the vicinity of the range, and the area remains undeveloped and vegetated.

Fragments of clay targets were observed northwest and northeast of the firing lines, as well as along the western firing line. The highest densities of fragments were observed approximately 325 feet northeast and 250 feet northwest of the firing line. Munitions debris was observed inside a wooded area approximately 250 feet northwest of the firing arc. The debris included multiple metal bases to 12-gauge shotgun shells and one casing from an expended .38-caliber bullet. Based on the density of the observed munitions debris, this area was likely a disposal area for small arms ammunition. No MEC was observed during the visual survey.



Figure 3: Skeet Range House foundation

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Figure 4: Saufley Field Skeet Range

Documents and Reports:

- History, Naval Air Station Gunnery Department Period Covered: 7 December 1941 to 1 November 1944. Naval Air Training Bases, Pensacola, Florida
- Preliminary Assessment Report NETPMSA Saufley Field, Escambia County, Florida, May 1992
- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Site Assessment Report Saufley Field Site 2406, NETPDTC, Pensacola, Florida, March 1998
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010
- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001
- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004
- Final Integrated Cultural Resources Management Plan, NAS Pensacola, Escambia County, Volume 1, February 2004
- Site Assessment Report Addendum for UST Site 2406, OLF Saufley NETPDTC, May 2005
- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006

Websites:

- www.naspensacola.navy.mil (Installation Information)

Maps:

- Map of Saufley Field Naval Auxiliary Air Station Pensacola, Florida, Showing Conditions on 30 June 1943
- Map of Saufley Field Naval Auxiliary Air Station Pensacola, Florida, Showing Conditions on 30 June 1946

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- Map of Saufley Field Naval Auxiliary Air Station Pensacola, Florida, Showing Conditions on 30 June 1947
- Map of Saufley Field Naval Auxiliary Air Station Pensacola, Florida, Showing Conditions on 30 June 1948
- Map of Saufley Field Naval Auxiliary Air Station Pensacola, Florida, Showing Conditions on 30 June 1949

Aerial Photographs:

- Aerial photograph of NAAS Saufley Field, NAS Pensacola, 5 July 1943
- Aerial photograph of NAAS Saufley, Florida, 19 February 1945

The historical records found at the national archives provided information regarding the Saufley Field Skeet Range. The range was shown on maps dated 1943 and 1946 through 1949, as well as aerial photography dated 1943 and 1945. Records containing the general history of Saufley Field and its use as a gunnery school were reviewed. In addition, the interviews with Navy personnel provided valuable information about the range.

Information Profiles

Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	Saufley Field Skeet Range
Range/Site Location	Saufley Field is located 10 miles north of NAS Pensacola in Escambia County, Florida. It lies east of Perdido Bay, west of Pensacola Bay, and north of the Gulf of Mexico.
Range/Site History	The range was shown on maps dated 1943 and 1946. The Skeet Range House is visible on aerial photographs of Saufley Field dated 1943 and 1945, as well as on maps dated 1948 and 1949. An information booklet dated 1945 describes the Skeet Range as two 100-foot by 100-foot areas with five stations each. No other information regarding the range history was identified.

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Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Range/Site Area and Layout	The Skeet Range is a 31.6-acre site located in the northwestern portion of Saufley Field, approximately 350 feet west of the northwest tip of the Saufley Field runways. The site boundary encompasses the two 100-foot firing areas and the SDZ associated with the firing lines. Four square, concrete firing pads form an arc on the western firing line, and three concrete building foundations are located south of the range along an asphalt jogging trail. The northern property fence for Saufley Field and the westernmost tip of the northwestern runway are located within the site boundary. The Saufley Field Small Arms Range, addressed during the 2007 PA of NAS Pensacola, is a 1.2-acre site located southwest of the Skeet Range. A small portion of the Small Arms Range boundary overlaps the Skeet Range boundary.
Range/Site Structures	The concrete foundations of the former Skeet Range House, Well House, and Pump House are located south of the firing lines. Four square, concrete firing pads form an arc along the western firing line. The western tip of the northwestern runway is located on the east side of the site. The Saufley Field security fence runs through the center of the site, and an asphalt jogging trail runs along the southern and eastern sides of the site.
Range/Site Boundaries	N: Undeveloped vegetated areas, wetlands, Eleven Mile Creek located approximately 1,000 feet to the north S: Asphalt jogging trail, airfield, Saufley Field Small Arms Range W: Undeveloped vegetated area, Saufley Field property boundary, Saufley Field Small Arms Range E: Asphalt jogging trail, airfield
Range/Site Security	A security check point must be passed to gain access to Saufley Field. A fence surrounds the airfield; however, access to the site is not directly restricted from Saufley Field.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	<p>Documentation on specific ordnance types used at the range was not identified; however, typical munitions used at Skeet Ranges include 12-, 16-, and 20-gauge shotgun ammunition and .410-caliber ammunition.</p> <p>The Saufley Field Small Arms Range boundary overlaps the southwestern portion of the Skeet Range. Munitions usage associated with the Small Arms Range includes .38-caliber, .45-caliber, .22-caliber, and .30-caliber ammunition; however, no munitions debris was observed at the Small Arms Range during the 2007 PA of NAS Pensacola.</p> <p>Munitions debris observed at the Skeet Range included 12-gauge shotgun debris and one casing for an expended .38-caliber bullet.</p>
Maximum Probability Penetration Depth	By design, skeet ammunition is dispersed as pellets over a small area in the direction of fire. Demolition of former ranges and site structures and construction and grading of former range areas may have resulted in deposition of lead shot and broken clay targets in the subsurface soil at the site.
MEC Density	Based on historical documentation, the Saufley Field Skeet Range was used for small arms training only. MEC or non-hazardous munitions-related scrap are not known or suspected to have been present at the site.
Munitions Debris	Munitions debris was concentrated in a wooded area 250 feet northwest of the firing arcs. It included multiple bases to 12-gauge shotgun shells and one casing from an expended .38-caliber bullet. Fragments of clay targets were also observed at the site.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Associated Munitions Constituents	<p>The primary MC associated with small arms ammunition is lead. Other MC may include antimony, arsenic, copper, zinc and constituents associated with black and/or smokeless powder; however, these constituents are less likely to be of concern as they are either present in only minor concentrations or are typically consumed when the small arms ammunition is fired.</p> <p>Clay pigeons were likely used as targets at the Skeet Range. Clay targets are typically bound together with petroleum products that contain polycyclic aromatic hydrocarbons (PAHs). Although PAHs are an associated MC, they tend to be tightly bound in the petroleum pitch and limestone matrix of the target and are therefore not readily available to the environment.</p> <p>Shallow, intermediate, and deep site monitoring wells were installed during a Site Assessment of UST Site 2406 at Saufley Field; however, no sampling regarding MC has been conducted at the site. No groundwater supply wells are located in the vicinity of the Skeet Range.</p>
Migration Routes/Release Mechanisms	<p>Migration of MC from the Saufley Field Small Arms Range may occur due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake. Human activities, including maintenance (e.g. mowing) and grading, can cause MC migration. Future construction, excavation, or other site work could also serve as a migration/release mechanism.</p>
Climate	<p>The climate at Saufley Field is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.</p>

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Topography	Saufley Field lies on a low ridge approximately 85 feet above mean sea level (msl). It gently slopes to 25 feet above msl to the north of Eightmile Creek, and it slopes to 10 feet above msl southward to the edge of Perdido Bay. The topography of the Skeet Range is relatively flat.
Geology	The Saufley Field Skeet Range is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface (bgs), and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).
Soil	Soils within the vicinity of the airfield and northeast of the field are generally well-drained sandy and loamy soils. The areas to the south, southwest, and northwest of the airfield are characterized by poorly drained sandy soils and muck. Surface sediments at Saufley Field have been classified with the Pickney Sand, Croatan and Pickney Soils, Poarch Sandy Loam, Grady Loam, Troup Sand, and Bonifay Loamy Sand soil complexes (USDA, 2004).

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWWMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWWMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWWMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for Saufley Field is a well field located at Naval Technical Training Center (NTTC) Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>No monitoring wells or groundwater information exists for the Skeet Range, but groundwater data was collected for a portion of Saufley Field. Shallow, intermediate, and deep site monitoring wells were installed during a Site Assessment of UST Site 2406 at Saufley Field. Addendum 2 of the 2003 Site Assessment Report shows deep groundwater flow is southwest, intermediate groundwater flow is west and southwest, and shallow groundwater flow is northwest and northeast. The estimated groundwater velocity was 0.34 feet per day in the shallow zone and 4.8 feet per day in the deeper zone. Water level elevations were recorded between 75.42 feet and 100.60 feet; however, no information was given regarding depths to ground water.</p>

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Hydrology	<p>Elevenmile and Eightmile Creeks are located in the northwest portion of Saufley Field. A 100-year floodplain follows each creek, but neither floodplain encroaches upon developed areas. Wetlands comprising 100.7 acres are present at Saufley Field.</p> <p>Wetlands exist on the northwest portion of the Skeet Range. Surface water runoff drains north along the site through the wetlands and towards Eight Mile Creek and Elevenmile Creek. The creeks flow southwest from Saufley Field towards Perdido Bay.</p>
Vegetation	<p>The southeastern portion of range is an open, grassy field. The western and northeastern portions of the site are vegetated with thick brush, low lying shrubs, and mature trees (pine and oak). The northern and northwestern portions of the site consist of wetlands.</p>

Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	<p>The Skeet Range is currently closed and has no designated or future planned land use. Two active runways at Saufley Field are located southeast of the range, the westernmost tip of the northwestern runway being located on the southeast corner of the site. NAS Whiting Field pilots use two of the airstrips for touch and go landing exercises.</p>
Current Human Receptors	<p>Current human receptors include Navy personnel, contractors, and trespassers/visitors. Navy personnel and contractors may access the site to perform environmental or ecological studies or maintenance activities. Trespassers/visitors may include hikers or naturalists who can access the site from Saufley Field.</p>
Current Activities (frequency, nature of activity)	<p>Current activities include infrequent environmental/ecological investigations by Navy personnel and/or contractors, and hiking by trespassers/visitors.</p>
Potential Future Land Use	<p>The potential future land use remains the same as the current land use, as no change in land use is planned.</p>
Potential Future Human Receptors	<p>Potential future human receptors remain the same as the current receptors, as no change in land use is planned.</p>
Potential Future Land Use Related Activities	<p>Potential future land use related activities remain the same as current land use related activities, as no change in land use is planned.</p>

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Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Zoning/Land Use Restrictions	Due to the close proximity to the runways, the zoning/land use restrictions at the Saufley Field Skeet Range are likely the same as those for the airfield.
Beneficial Resources	There are no beneficial resources identified at the Saufley Field Skeet Range. Over 100 acres of wetlands are located at Saufley Field, some of which cover the northern boundary of the Skeet Range.
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (2000 Census). Approximately 1,356 personnel were employed at Saufley Field in Fiscal Year 2003.

Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	According to the 2003 Escambia County Joint Land Use Study, the Skeet Range is located in an area containing floodplain forests and unique longleaf (<i>Pinus palustris</i>) and mixed pineforests. The Skeet Range is bordered by mature trees, thick underbrush, and small shrubs. The majority of the range is an open, grassy field.
Degree of Disturbance	The current and future land uses of the Skeet Range result in a low degree of disturbance to the habitat or ecological receptors.
Ecological Receptors	Terrestrial ecological receptors may include mammals (e.g., foxes, bears, and squirrels), reptiles (e.g., tortoises), terrestrial plants, and a variety of bird species. Aquatic ecological receptors in nearby surface water may include various species of fish, amphibians, and aquatic/wetland vegetation. Currently, there are no known threatened or endangered species on the Skeet Range. The gopher tortoise (<i>Gopherus polyphemus</i>) is a state-listed threatened species in the State of Florida and the species has been observed at Saufley Field, based upon the 2000-2010 Integrated Natural Resource Management Plan.
Relationship of MEC/MC Sources to Habitat and Potential Receptors	Flora may bioaccumulate MC in surface and/or subsurface soil, via plant uptake. Fauna may be exposed to MC in surface soil through ingestion, dermal contact, and inhalation, or by ingesting vegetation or prey organisms that may bioaccumulate MC.

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Graphical Presentations

The attached Munitions Characterization Map and Exposure Pathway Analysis Figure provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Historical and visual evidence indicate that MEC are not present at the site; therefore, there are no complete exposure pathways for MEC. As such, an Exposure Pathway Analysis Figure for MEC was not created. However, information obtained and visual observations indicate that the potential for MC exists.

The Exposure Pathway Analysis figure provides a summary of complete, potentially complete, and incomplete exposure pathways for MC. For MC, interaction between the source (e.g., MC in surface soil) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

MC Exposure and Pathway Analysis

The pathway analysis for MC is shown on Figure 5. Potential receptors include both human (Navy personnel, contractor, and trespasser/visitor) and ecological (biota) receptors that may come in contact with MC in the source medium or other potentially contaminated media from the site. Pathways are shown for each exposure medium and are discussed below.

Surface Water/Sediment: MC may migrate from soil to surface water/sediment through surface water runoff to Eightmile and Elevenmile Creeks. Additionally, groundwater from the site may discharge into the creeks as surface water. Potential receptors include trespassers/visitors exploring the area and aquatic and terrestrial biota that forage in the sediment and/or ingest surface water. Potentially complete exposure pathways exist for these receptors via incidental ingestion and dermal contact. Navy personnel and contractors working in the area are unlikely to be exposed to the surface water and associated wetlands which are on the perimeter of Saufley Field or off site.

Surface Soil (0-2 feet): MC may be present in surface soils at the range in the vicinity of the firing arc. Potential receptors include Navy personnel conducting maintenance on the range, contractors working in the area, trespassers/visitors exploring the area, and biota that construct burrows or forage on the range. Potentially complete exposure pathways exist for receptors via ingestion and dermal contact. Inhalation exposure to MC in dust is unlikely due to the thick vegetation and high precipitation in the area, which minimize dust and wind on the range.

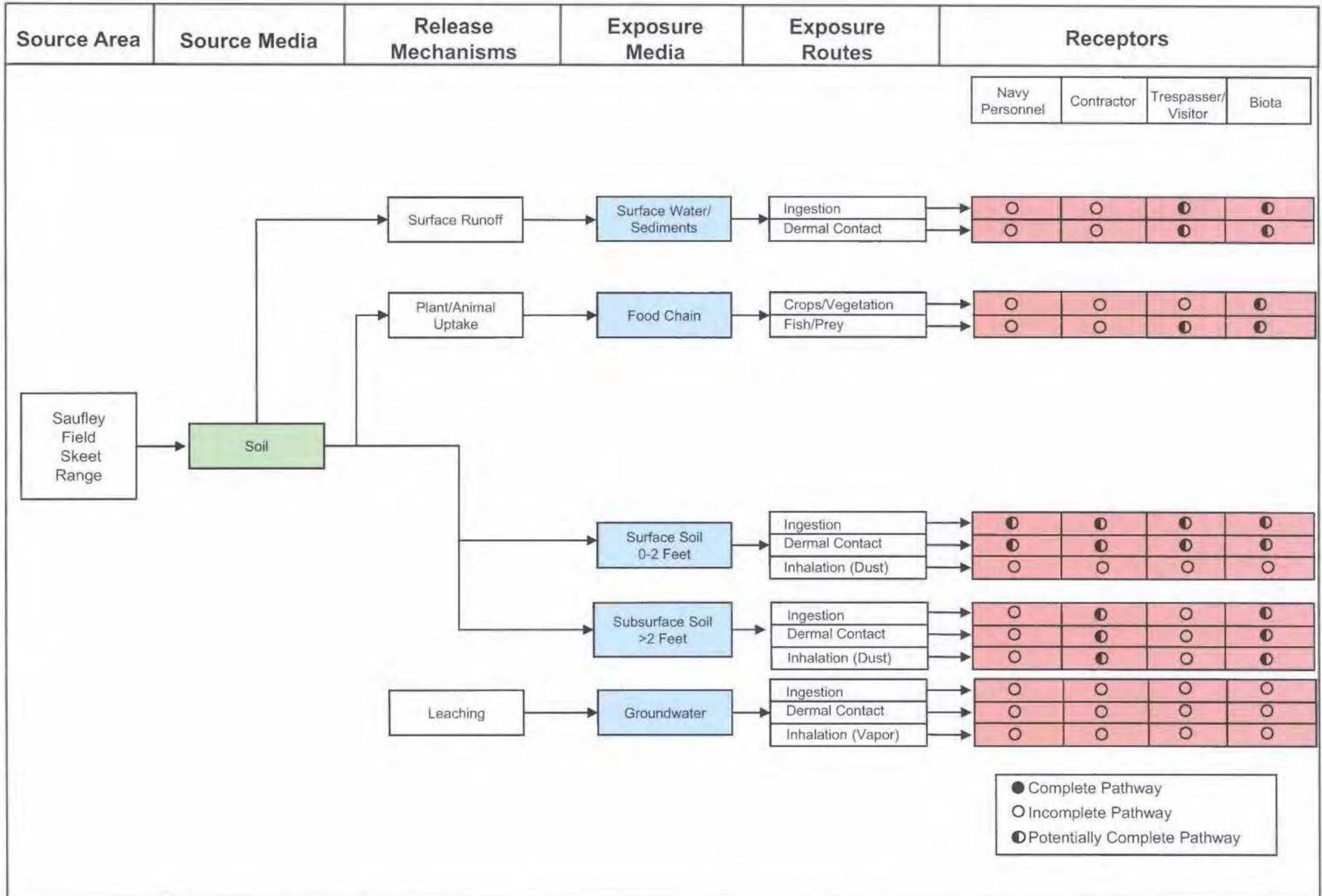
Subsurface Soil (>2 feet): MC may be present in subsurface soil at the range due to migration from the overlying surface soil via leaching mechanisms. Although there are no current or planned intrusive activities at the range, contractors may be exposed to MC during excavation activities such as during maintenance on underground utilities. Some biota (e.g., foxes) may also be exposed to MC in subsurface

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soil while constructing burrows. Potentially complete exposure pathways therefore exist for these receptors via incidental ingestion, dermal contact, and inhalation of dust caused by subsurface drilling or soil excavation (including burrowing). Navy personnel and trespassers/visitors are unlikely to come in contact with MC in the subsurface soil, since no intrusive activities at the range would be conducted by these groups. Therefore, exposure pathways are considered incomplete for these receptors.

Groundwater: The main source of potable water for Saufley Field is a well field located at NTTC Corry Station which is north of Bayou Grande; therefore, groundwater at this site will not be used as a potable water supply. Because no activities are conducted at the site that would result in contact with MC in groundwater, groundwater exposure pathways are considered to be incomplete for all receptors.

Food Chain: MC in soil may be bioaccumulated by plants or consumed by animals foraging on the range. Predation of prey and/or consumption of vegetation on the range may result in bioaccumulation of MC. Potentially complete exposure pathways are identified for biota that may be exposed to MC through the food chain, and for trespassers/visitors who may fish in the nearby creeks.



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MALCOLM
PIRNIE

Munitions Characterization
Saufley Field Skeet Range

Legend

-  Installation Boundary
-  Range/Site Boundary
-  Surface Danger Zone
-  Historical Site Features
-  Clay Fragments
-  Munitions Debris
- MEC Presence***
-  Known
-  Suspect

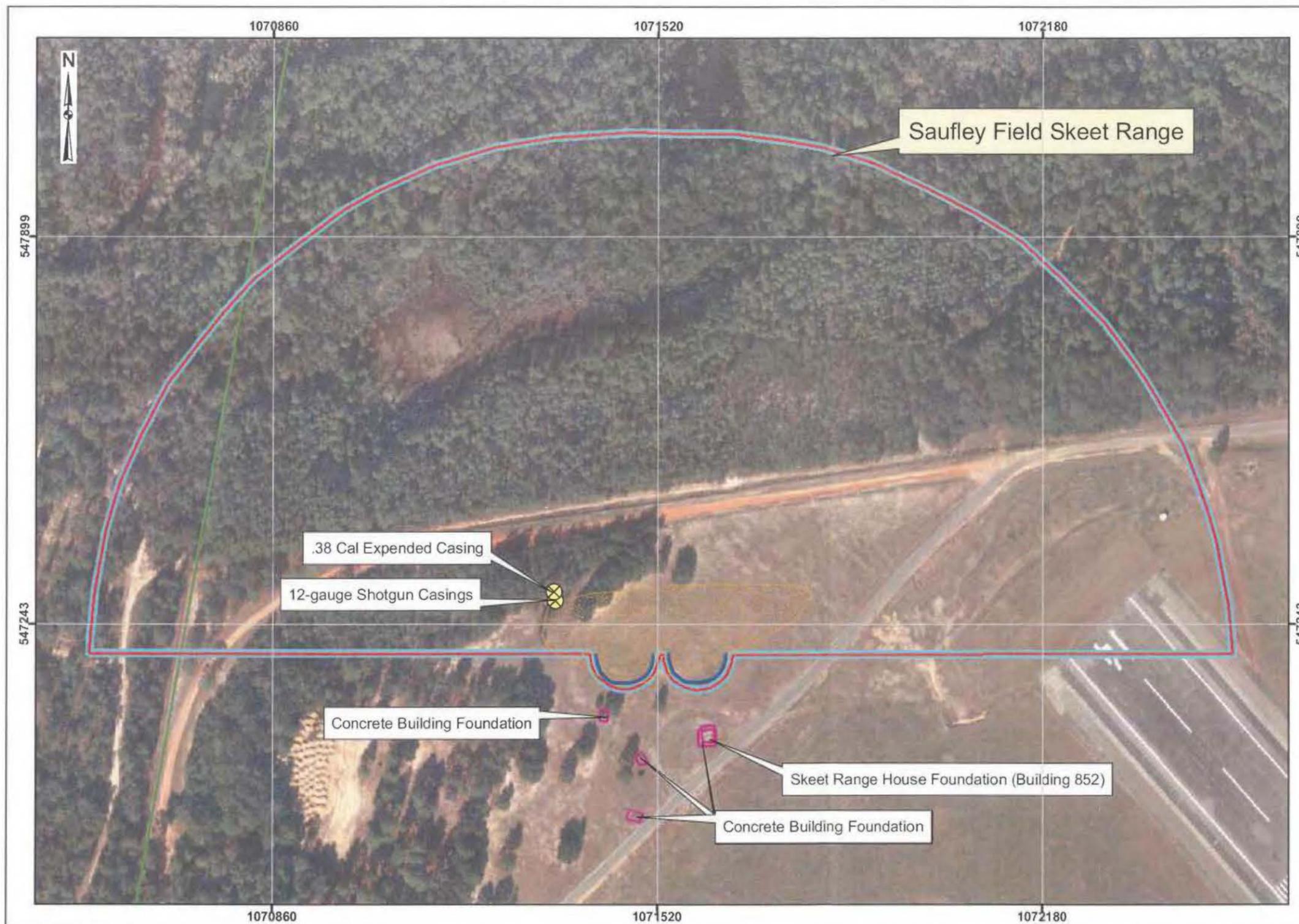
*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.

0 25 50 100 Meters

Data Source: NAS Pensacola, GIS Data, 2007
Map of Saufley Field, Naval Auxiliary Air Station, Pensacola, FL, Showing Conditions on June 30, 1946

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
Edition: Interim Conceptual Site Model
Date: July 2008



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Preface

This interim deliverable provides the Navy with a summary of information collected to date and the data sources used to support the Conceptual Site Model (CSM). It summarizes our current understanding of the site, presented in the attached Information Profiles. It also provides draft Graphical Presentations of the site layout and CSM. The Information Profiles and the Graphical Presentations will serve as the basis of the CSM section of the Preliminary Assessment (PA) Report.

This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field (OLF) Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. Bayou Grande intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center; Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

Saufley Field is a 657-acre airfield with two inactive and two active runways. It was commissioned as Saufley Field on 26 August 1940 in honor of Lieutenant Richard Caswell Saufley, designated Naval Aviator No. 14. An instrument flying school and the first primary training squadron were initially based there. The student population increased with the outbreak of World War I (WWI), and Saufley Field was consequently commissioned as Naval Auxiliary Air Station (NAAS) Saufley Field. Gunnery staffs were set up at NAAS

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Saufley Field in 1943 to give fundamental gunnery instruction to pilots. By 1945, the field was used for conducting intermediate CV specialized training in SBD aircraft. The mission of Saufley Field was revised to provide support for training squadrons VT-1 and VT-5 in 1960. NAAS Saufley was recommissioned as Naval Air Station (NAS) Saufley Field in 1968; however, the on-site training squadrons were decommissioned in late 1976, and the field was then decommissioned to Naval Outlying Field (OLF) Saufley Field. In 1979, Saufley Field was reactivated as a Naval Education and Training Program Development Technology Center (NETPDTC), and the field's name was officially changed to NETPDTC Saufley in 1996. Its current mission is to support Training Air Wings 5 and 6 and to serve as home for several Department of Defense and other U.S. Government organizations as a joint use facility. Saufley Field has four runways; two 4,000-foot runways are currently active while the two others are inactive. Three hangars providing over 34,000 square feet of hangar space and 63 buildings containing over 600,000 square feet of space are located on the airfield.

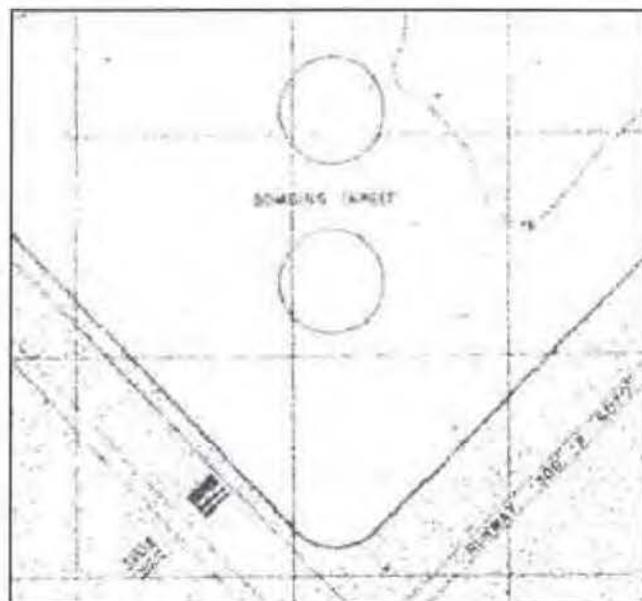


Figure 1: Aerial photograph of Saufley Field.

The Saufley Field Bombing Targets consisted of two circular targets with diameters of approximately 200 feet each. They were located approximately 500 feet north of the intersecting runways at Saufley Field. The two targets appear on maps of NAAS Saufley Field dated 1943 and 1946 through 1949. They are also visible in aerial photography of Saufley Field dated 1943 and 1945. The site boundary of the site described in this ICSM is the area within the 500 foot target scoring arc for the bombing targets. No other records of the bombing targets have been found.

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A visual survey of the Saufley Field Bombing Targets was conducted on 23 January 2007 during the site visit associated with the PA of the Saufley Field Small Arms Range (the site visit for this PA is discussed in the following sections). No MEC, munitions debris, evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site were observed.



**Figure 2: Bombing Targets, 1946 Map of NAAS
Saufley**

Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
- National Museum of Naval Aviation
- Historical Map Files, Building 458

Personal Interviews:

- Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department
- Mr. Jim Kane, Deputy Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Steve Ward, Real Property Management, NAVFAC SE Public Works Department Pensacola
- Commander Kristine Nielsen, Public Works Officer, NAVFAC SE Public Works Department Pensacola

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- Mr. Bill Taylor, NAVFAC SE Public Works Department Environmental
- Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE Public Works Department Pensacola
- Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc.
- Mr. Jeff Halstead, Exhibit Specialist, Fort Pickens State Park
- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park
- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

A visual survey of the Saufley Field Bombing Targets was conducted on 29 November 2007 during the site visit for this PA. Malcolm Pirnie team members Ms. Susan Burnett, Ms. Angela Nolan, and Mr. Dan Hains were present. The purpose of the visual survey was to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), any evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site.

The bombing targets were located in a grassy area just north of the airfield. No MEC, munitions debris, ground scarring, or evidence of former range activities was observed during the visual survey. With the exception of the runways, no structures exist at the site or in the immediate vicinity.

Documents and Reports:

- Preliminary Assessment Report NETPMSA Saufley Field, Escambia County, Florida, May 1992
- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Site Assessment Report Saufley Field Site 2406, NETPDTC, Pensacola, Florida, March 1998
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010
- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001
- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004
- Final Integrated Cultural Resources Management Plan, NAS Pensacola, Escambia County, Volume 1, February 2004
- Site Assessment Report Addendum for UST Site 2406, OLF Saufley NETPDTC, May 2005
- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006

Websites:

- www.naspensacola.navy.mil (Installation Information)

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Maps:

- Map of Saufley Field Naval Auxiliary Air Station Pensacola, Florida, Showing Conditions on 30 June 1943
- Map of Saufley Field Naval Auxiliary Air Station Pensacola, Florida, Showing Conditions on 30 June 1946
- Map of Saufley Field Naval Auxiliary Air Station Pensacola, Florida, Showing Conditions on 30 June 1947
- Map of Saufley Field Naval Auxiliary Air Station Pensacola, Florida, Showing Conditions on 30 June 1948
- Map of Saufley Field Naval Auxiliary Air Station Pensacola, Florida, Showing Conditions on 30 June 1949

Aerial Photographs:

- Aerial photograph of NAAS Saufley Field, NAS Pensacola, 5 July 1943
- Aerial photograph of NAAS Saufley Field, Florida, 19 February 1945

The historical records found at the National Archives provided information regarding the Saufley Field Bombing Targets. The targets were shown on maps dated 1943 and 1946 through 1949. They are also visible in aerial photography dated 1943 and 1945. Records obtained from the installation included a PA report, which was conducted at Saufley Field in 1991. In addition, the interviews with Navy personnel provided valuable information about the range.

Information Profiles

Conceptual Site Model Information Profiles - Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	Saufley Field Bombing Targets
Range/Site Location	Saufley Field is located 10 miles north of NAS Pensacola in Escambia County, Florida. It lies east of Perdido Bay, west of Pensacola Bay, and north of the Gulf of Mexico.
Range/Site History	The Bombing Targets are depicted on maps dated 1943 and 1946 through 1949. They are also visible in aerial photography dated 1943 and 1945. No other information regarding the range history was available.
Range/Site Area and Layout	The Bombing Targets are two 200-foot diameter circular targets. The total site acreage for the Bombing Targets is 91.6 acres (based on the boundaries of the surface danger zones). The targets are located 500 feet north of the intersecting runways at Saufley Field.

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Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Range/Site Structures	The airfield is located approximately 500 feet south of the Bombing Targets. No other structures exist at the site or in the immediate vicinity.
Range/Site Boundaries	N: Grassy field, asphalt jogging trail/road, Saufley Field property boundary, undeveloped vegetated area S: Airfield W: Airfield, mowed grassy area, Saufley Field Skeet Range E: Airfield, mowed grassy area
Range/Site Security	A security check point must be passed to gain access to Saufley Field. A fence surrounds the airfield, but access to the site is not directly restricted from Saufley Field.

Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	Documentation on specific ordnance types used at the range was not identified; however, due to the proximity to the runways, ammunition used at the bombing targets likely included various sizes of inert practice bombs with spotting charges. The area comprising the Bombing Targets appears disturbed in historical aerial photographs, but no evidence of craters was observed in the photos or during the site walk.
Maximum Probability Penetration Depth	The depth to which munitions penetrate below the ground surface depends on many factors, including the type of soil, the angle of impact, the size of the munition, the velocity at impact, and site-specific environmental conditions. Typical ordnance penetration depths for loamy soils range from 3.51 feet for 3-pound bombs to 7.12 feet for 25-pound bombs. No evidence of surface cratering was observed in aerial photos or during the site walk of the Bombing Targets.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
MEC Density	Munitions usage at the Bombing Targets was likely limited to inert practice bombs; however, the spotting charges associated with inert bombs qualify as MEC. The density of MEC is unknown due to lack of information regarding the frequency and quantity of munitions usage at the site. No evidence of ground scarring is visible in historic aerial photographs of the bombing targets. The grounds are regularly maintained and there have been no reported findings of MEC. Although no MEC were observed during the visual surveys conducted in January 2007 and November 2007, no subsurface investigations have been conducted to verify the presence or absence of MEC in subsurface soil.
Munitions Debris	No evidence of munitions debris was identified during the visual survey.
Associated Munitions Constituents	<p>Due to their proximity to the airfield, practice bombs were likely used at the Bombing Targets. Inert fillers in typical practice bombs included water and/or sand. Spotting charges that potentially contained trace quantities of MC including titanium tetrachloride, red phosphorous, and pyrotechnics may also have been used.</p> <p>Shallow, intermediate, and deep site monitoring wells were installed during a Site Assessment of UST Site 2406 at Saufley Field; however, no sampling regarding MC has been conducted at the Bombing Targets.</p>
Migration Routes/Release Mechanisms	<p>MEC migration may occur due to soil erosion; however, the grounds at the Bombing Targets are relatively flat, vegetated with thick grass, and are regularly maintained. Migration of MEC from subsurface soil to surface soil is therefore not expected.</p> <p>Migration of MC from the Saufley Field Bombing Targets may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake. Human activities, including maintenance (e.g. mowing) and grading, can cause MC migration. Future construction, excavation, or other site work could also serve as a migration/release mechanism.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Climate	<p>The climate at Saufley Field is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.</p>
Topography	<p>Saufley Field lies on a low ridge approximately 85 feet above mean sea level (msl). It gently slopes to 25 feet above msl to the north of Eightmile Creek, and it slopes to 10 feet above msl southward to the edge of Perdido Bay. The topography at the Bombing Targets is relatively flat.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Geology	<p>The Bombing Targets are located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface (bgs), and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).</p>
Soil	<p>Soils within the vicinity of the airfield and northeast of the field are generally well-drained sandy and loamy soils. The areas to the south, southwest, and northwest of the airfield are characterized by poorly-drained sandy soils and muck. Surface sediments at Saufley Field have been classified with the Pickney Sand, Croatan and Pickney Soils, Poarch Sandy Loam, Grady Loam, Troup Sand, and Bonifay Loamy Sand soil complexes (USDA, 2004).</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for NAS Pensacola is a well field located at Naval Technical Training Center (NTTC) Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>No monitoring wells or groundwater information exists for the Bombing Targets, but groundwater data was collected for a portion of Saufley Field. Shallow, intermediate, and deep site monitoring wells were installed during a Site Assessment of UST Site 2406 at Saufley Field. Addendum 2 of the 2003 Site Assessment Report shows deep groundwater flow is southwest, intermediate groundwater flow is west and southwest, and shallow groundwater flow is northwest and northeast. The estimated groundwater velocity was 0.34 feet per day in the shallow zone and 4.8 feet per day in the deeper zone. Water level elevations were recorded between 75.42 feet and 100.60 feet; however, no information was given regarding depths to ground water.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrology	<p>Elevenmile and Eightmile Creeks are located in the northwest portion of Saufley Field. A 100-year floodplain follows each creek, but neither floodplain encroaches upon developed areas. Wetlands comprising 100.7 acres are present at Saufley Field.</p> <p>The Bombing Targets are located in an active airfield, and no surface water features are located in the vicinity of the targets. No drainage or stormwater collection systems were observed in the vicinity of the Bombing Targets during the PA site visit.</p>
Vegetation	The Bombing Targets and immediate vicinity are completely vegetated with turf grass that is periodically mowed.

Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	The Bombing Targets are located approximately 200 feet to the north of the runways at the airfield. NAS Whiting Field pilots use two of the airstrips for touch and go landing exercises.
Current Human Receptors	Current human receptors include Navy personnel, contractors, and trespassers/visitors. Navy personnel may access the site to conduct maintenance (i.e. mowing), and contractors may access the site to perform maintenance (e.g. maintenance on underground utilities). Trespassers/visitors may include hikers or naturalists who can access the site from Saufley Field.
Current Activities (frequency, nature of activity)	Current activities include grounds maintenance by Navy personnel and/or contractors, and hiking by trespassers/visitors.
Potential Future Land Use	The potential future land use remains the same as the current land use, as no change in land use is planned.
Potential Future Human Receptors	Potential future human receptors consist of the current receptors, as no change in land use is planned.
Potential Future Land Use Related Activities	Potential future land use related activities remain the same as the current land use related activities, as no change in land use is planned.
Zoning/Land Use Restrictions	Due to close proximity to the active runways, the zoning/land use restrictions at the Bombing Targets likely fall under the zoning/land use restrictions of the airfield.

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Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Beneficial Resources	There are no beneficial resources identified at the Saufley Field Bombing Targets.
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (2000 Census). Approximately 1,356 personnel were employed at Saufley Field in Fiscal Year 2003.

Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	The Bombing Targets are vegetated with grass that is periodically mowed.
Degree of Disturbance	The current and future land uses of the Bombing Targets and adjacent airfield result in a high degree of disturbance to the habitat or ecological receptors.
Ecological Receptors	Terrestrial ecological receptors may include terrestrial plants, as well as mammals (e.g., foxes, bears, and squirrels) and a variety of bird species passing through the area. The close proximity to the active runways and periodic grounds maintenance create an unsuitable habitat for ecological receptors. The gopher tortoise (<i>Gopherus polyphemus</i>) is a state-listed threatened species in the State of Florida and the species has been observed at Saufley Field, based upon the 2000-2010 Integrated Natural Resource Management Plan.
Relationship of MEC/MC Sources to Habitat and Potential Receptors	Human receptors can come into contact with MEC in subsurface soil while conducting intrusive activities (e.g. maintenance on underground utilities). Flora may bioaccumulate MC in surface and/or subsurface soil, via plant uptake. Fauna may be exposed to MC in surface soil through ingestion, dermal contact, and inhalation, or by ingesting vegetation or prey organisms that may bioaccumulate MC.

Graphical Presentations

The Munitions Characterization Map and Exposure Pathway Analysis Figure provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Based on the information

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obtained during the site visit (including observations made during the visual survey and data collected during the site visit), both MEC and MC potentially exist at the site.

The Exposure Pathway Analysis figure provides a summary of complete, potentially complete, and incomplete exposure pathways for MEC and MC. For MEC, interaction between the potential receptors and an MEC source has two components. The receptor must have access to the source and must engage in some activity that results in contact with individual MEC items within the source area. For MC, interaction between the source (e.g., MC in surface soil) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

MEC Exposure and Pathway Analysis

The pathway analysis for MEC is shown in Figure 3. Potential receptors include human (Navy personnel, contractors, and trespasser/visitor) and ecological (biota) receptors. The various pathways are discussed below.

MEC in Surface Soil: No MEC or evidence of MEC was observed at the site during the 2007 site visits. Additionally, the grounds at the Bombing Targets are regularly mowed, and no findings of MEC have been reported at the site. Although it is possible for subsurface MEC to migrate to the surface by erosion, the level topography and regular maintenance of the turf at the site limit the ability for erosion to occur. Pathways to surface MEC are therefore incomplete for all receptors.

MEC in Subsurface: MEC may be present in the subsurface soil at the site. Exposure pathways are potentially complete for Navy personnel and contractors who may be exposed to subsurface MEC during intrusive activities such as underground utilities maintenance or intrusive environmental investigations. Visitors/trespassers and ecological receptors are not expected to participate in intrusive activities at the site, therefore pathways to subsurface MEC are incomplete for these receptors.

MC Exposure and Pathway Analysis

The pathway analysis for MC is shown in Figure 4. Potential receptors include both human (Navy personnel, contractor, and trespasser/visitor) and ecological (biota) receptors that may come in contact with MC in the source medium or other potentially contaminated media from the site. Pathways are shown for each exposure medium and are discussed below.

Surface Water/Sediment: MC may migrate from soil to surface water/sediment through surface water runoff; however, no surface water/sediment is located within the vicinity of the Bombing Targets. Surface water/sediment exposure pathways are therefore considered incomplete for all receptors.

Surface Soil (0-2 feet): MC may be present in surface soils at the range in the vicinity of the Bombing Targets. Potential receptors include Navy personnel and contractors/visitors conducting maintenance on the range, trespassers/visitors, and biota that forage on the range. Potentially complete exposure pathways exist for receptors via ingestion and dermal contact. Inhalation exposure to MC in dust is

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unlikely, due to the thick vegetation and high precipitation in the area, which minimize dust and wind on the range.

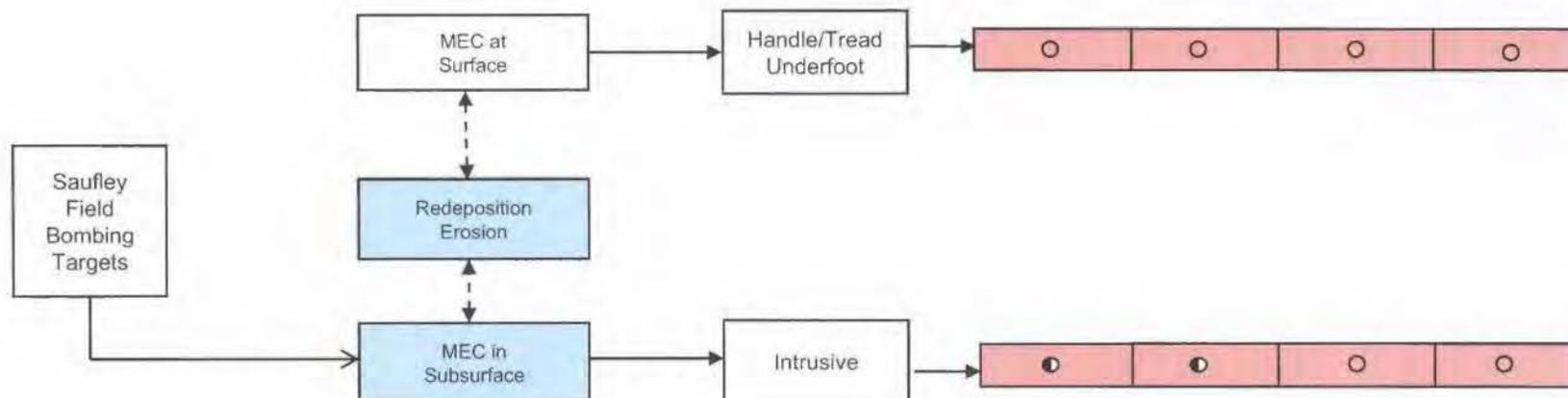
Subsurface Soil (>2 feet): MC may be present in subsurface soil at the range due to migration from the overlying surface soil via leaching mechanisms. Although there are no current or planned intrusive activities at the range, contractors may be exposed to MC in the subsurface soil during maintenance such as maintenance on underground utilities. Potentially complete exposure pathways therefore exist for these receptors via incidental ingestion, dermal contact, and inhalation of dust caused by subsurface drilling or soil excavation. Ecological receptors, Navy personnel, and trespassers/visitors are unlikely to come in contact with MC in the subsurface soil, since no intrusive activities at the range would be conducted by these groups. Therefore, exposure pathways are considered incomplete for these receptors.

Groundwater: Water level elevations at UST Site 2406 in the vicinity of the Bombing Targets were recorded between 75.42 feet and 100.60 feet. The main source of potable water for Saufley Field is a well field located at NTTC Corry Station, located to the north of Bayou Grande. No activities are conducted at the site that would result in contact with groundwater; therefore, groundwater exposure pathways are considered to be incomplete.

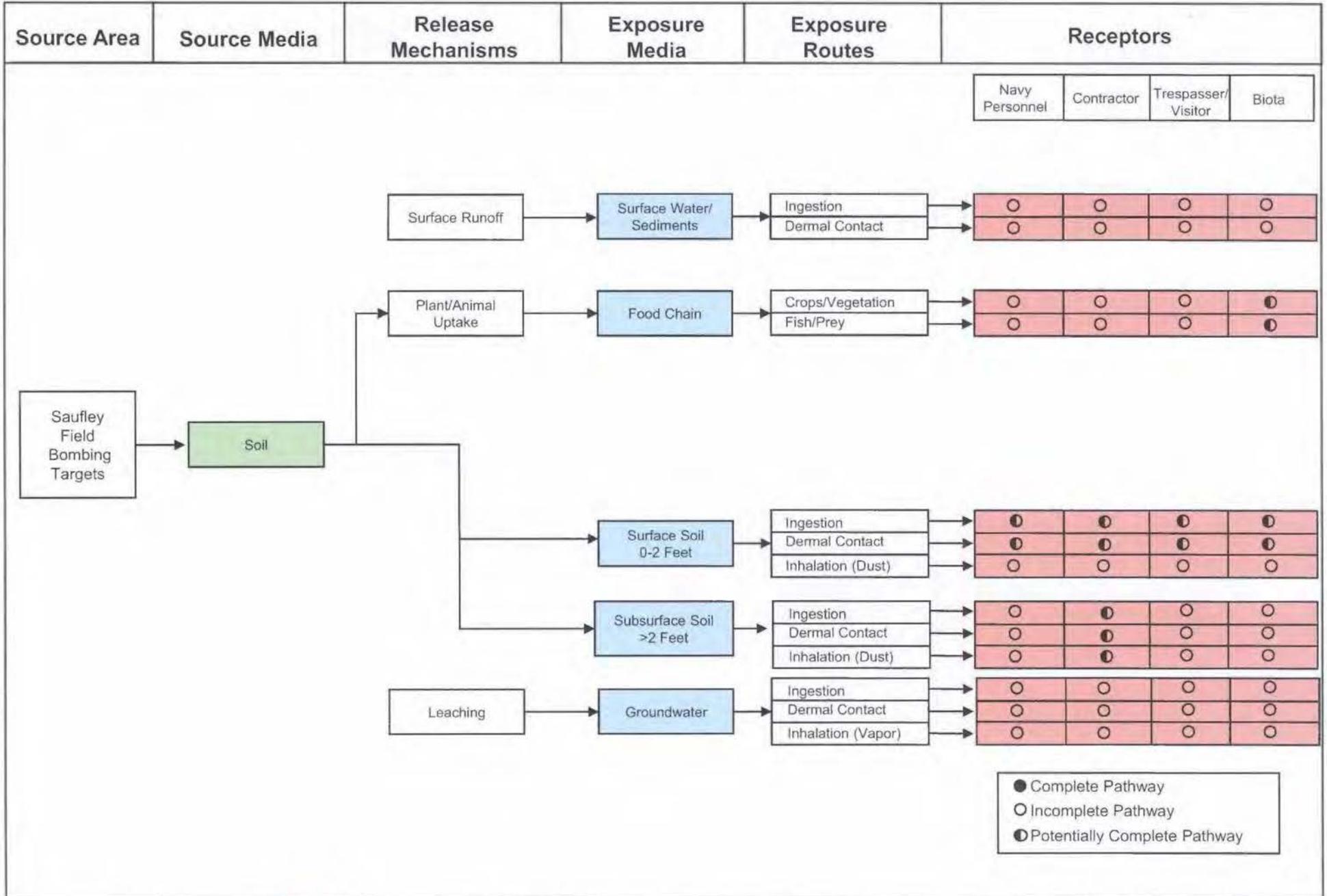
Food Chain: MC in soil may be bioaccumulated by plants or animals foraging on the range. Predation of prey and/or consumption of vegetation on the range may result in bioaccumulation of MC. Potentially complete exposure pathways are identified for biota that may be exposed to MC through the food chain. The Bombing Targets do not have areas for fishing or hunting within the vicinity; therefore, exposure pathways are considered to be incomplete for human receptors.

Source Area	Access	MEC Location/ Release Mechanisms	Activity	Receptors
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Navy Personnel	Contractor	Trespasser/ Visitor	Biota
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● Complete Pathway
 ○ Incomplete Pathway
 ◐ Potentially Complete Pathway



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**MALCOLM
PIRNIE**

Munitions Characterization
Saufley Field Bombing Targets

Legend

- Installation Boundary
- Range/Site Boundary
- Surface Danger Zone
- Historical Site Features
- Scoring Arcs
- MEC Presence***
- Known
- Suspect

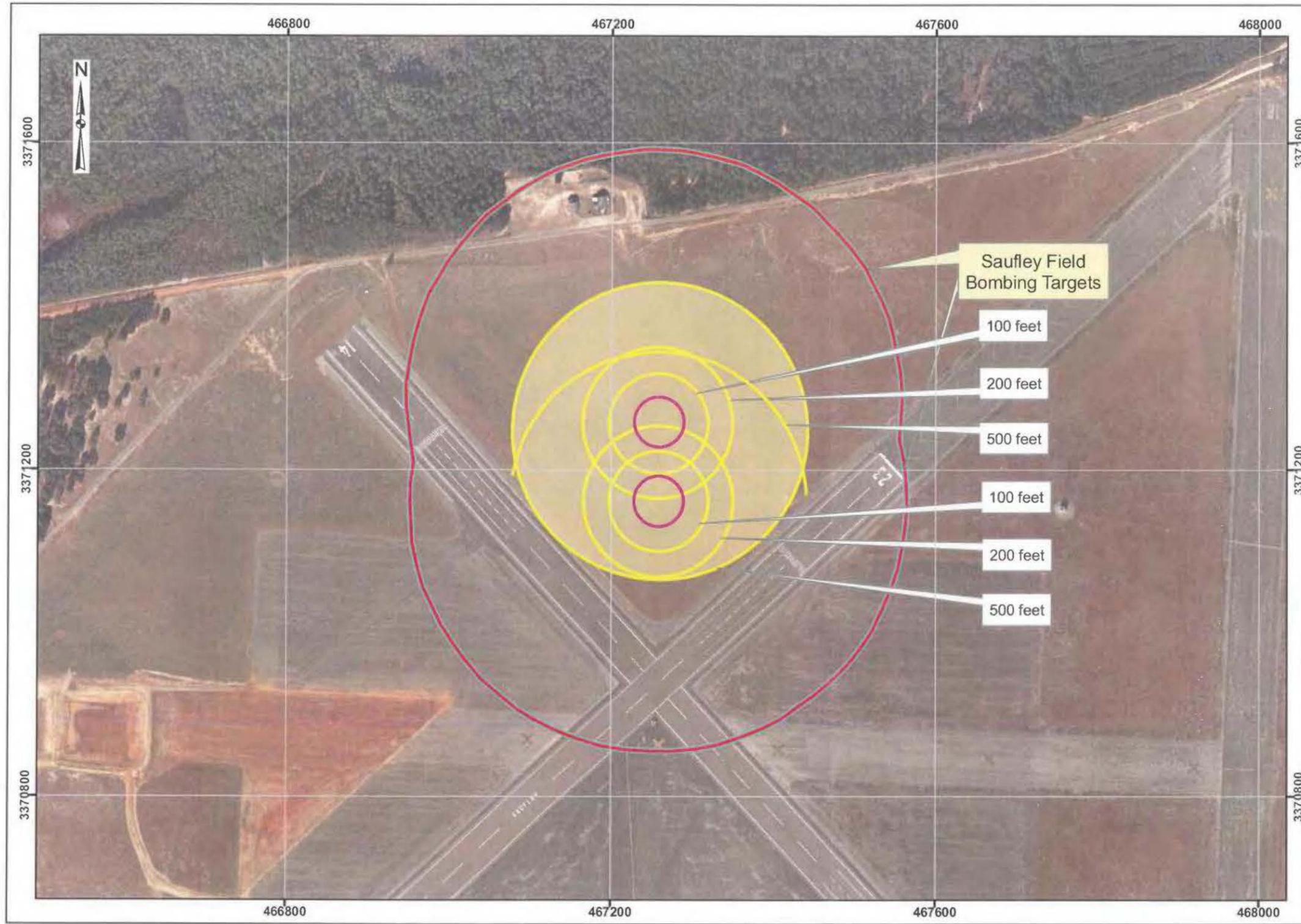
*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.



Data Source: NAS Pensacola, GIS Data, 2007
Map of Saufley Field, Naval Auxillary
Air Station, Pensacola, FL,
Showing Conditions on June 30, 1946

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
Edition: Interim Conceptual Site Model
Date: July 2008



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Preliminary Assessment
OLF Bronson Field Skeet Range and Pistol Range
Naval Air Station Pensacola, Florida

Preface

This interim deliverable provides the Navy with a summary of information collected to date and the data sources used to support the Conceptual Site Model (CSM). It summarizes our current understanding of the site, presented in the attached Information Profiles. It also provides draft Graphical Presentations of the site layout and CSM. The Information Profiles and the Graphical Presentations will serve as the basis of the CSM section of the Preliminary Assessment (PA) Report.

This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field (OLF) Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. The Bayou Grande bay intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center; Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

OLF Bronson Field is a 950-acre airfield that was in operation from 1942 to 1950. The site is located on the east side of Perdido Bay, approximately five miles west of Pensacola, Florida and about one mile east of the Alabama border. When the airfield was built in 1942 to train Navy dive bomber and fighter pilots, it was called Tarkiln Field; however, in 1944 the name was changed to Bronson Field in honor of Lt. Clarence Bronson, Naval Aviator No. 15, who lost his life in a premature bomb explosion at Indian Head, Maryland.

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In January 1943, seaplane training began at OLF Bronson Field, as well. OLF Bronson Field had four active 4,000-foot runways, as well as a seaplane ramp located on the shore of Perdido Bay. When the airfield was closed in late 1950, the runways were still used for touch and go landings and for helicopter training. After 1950, base dismantling activities were conducted and by 1968, all buildings located at OLF Bronson were razed. Currently, all four runways and the seaplane ramp located on OLF Bronson Field are inactive and abandoned. The OLF, now known as the Blue Angel Recreation Park, is predominantly made up of grass and forested areas, along with the four airstrips and the remains of several support buildings. The old seaplane ramp is currently used as a parking/storage area for campers. According to a 1992 PA conducted at OLF Bronson Field, the area is used by Combat Support Squadron 16 helicopters for training. In addition, there is a campground located in the forested area to the west of the old seaplane hangars. Personnel include Morale, Welfare, and Recreation (MWR) employees who operate the campground, conduct minor maintenance at the facility, and teach sailing and windsurfing.



Figure 1: Aerial photograph of Bronson Field.

The OLF Bronson Field Skeet Range is located approximately 400 feet to the southeast of OLF Bronson Field Runway 4 and approximately 500 feet to the west of Runway 36. The total acreage within the range boundary designated for the OLF Bronson Field Skeet Range is approximately 38.9 acres, and includes the Skeet Range boundary, as well as its Surface Danger Zone (see attached ICSM site map). Evidence of the former range was observed during a visual site survey conducted between 23 and 25 January 2007 for a separate PA for the OLF Bronson Field Firing Range (observations made during the site visit for this PA are described later). Evidence consisted of clay target fragments occurring in varying densities along the ground surface of the wooded area throughout the site. This Skeet Range can be seen on historical maps dated 1943, 1944, 1946, 1948, and 1949, and is mentioned in a 1945 historical document that summarizes activities and facilities for NAS Pensacola, obtained from the National Archives. A skeet range house used

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for storage (Building 1145) and four structures that appear to be high/low skeet houses were also denoted on these historical maps, indicating that this was a multiple field skeet range with up to three fields. Building 1145 was purchased by St. Anne's Catholic Chapel of Pensacola in July 1948 and was approved for demolition on 8 June 1950. No evidence of these buildings was observed during the visual site survey conducted in January of 2007. No additional information regarding munitions use associated with this range was obtained during the archival data search or site survey activities.

A separate berm was observed during the visual site survey conducted in January of 2007 for the OLF Bronson Field Firing Range. After discovering a historical document dated 1945 during the archival data search, this berm was determined to be associated with a previously unidentified pistol range, with dimensions of 75 feet by 150 feet. The range boundary for the OLF Bronson Field Pistol Range displayed on the ICSM site map encompasses the 75-foot by 150-foot range area, as well as the backstop berm, resulting in a 1.25-acre range boundary. The berm for the OLF Bronson Field Pistol Range is located approximately 200 feet south of the OLF Bronson Field Skeet Range, and measures approximately 330 feet long, 8 feet high, and 90 feet wide. The berm is denoted as a "butt" and is depicted on historical maps dated 1943, 1944, 1946, 1948, and 1949, obtained from the National Archives. No additional information regarding munitions use associated with this range was obtained during the archival data search or site survey activities.

This ICSM addresses the area within the site boundary (approximately 47.6 acres), which includes the range boundaries for the OLF Bronson Field Skeet Range and Pistol Range, as well as any excess area between the two former ranges; therefore, the sum of the acreage within the range boundaries is less than the total acreage within the site boundary.

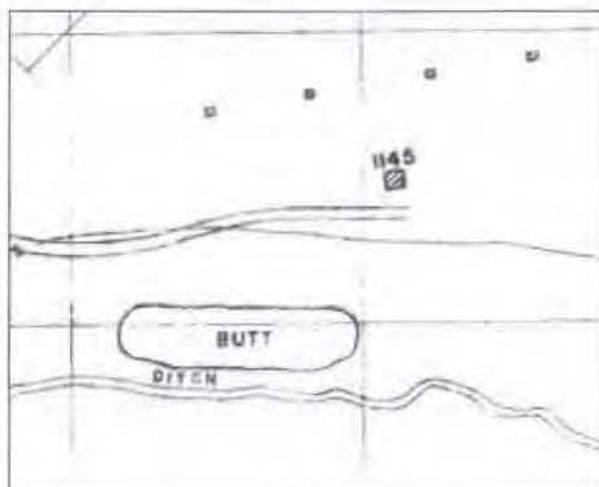


Figure 2: Building 1145 and four high/low skeet houses for Skeet Range, as well as the berm for the Pistol Range, according to 1943 map of Bronson Field

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Four pintle mounts were also observed approximately 100 feet north of the Pistol Range berm during the January 2007 site survey; however, no historical documents were identified that linked the pintle mounts to either the Skeet Range or Pistol Range.

Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
- National Museum of Naval Aviation
- Historical Map Files, Building 458

Personal Interviews:

- Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department
- Mr. Jim Kane, Deputy Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Steve Ward, Real Property Management, NAVFAC SE Public Works Department Pensacola
- Commander Kristine Nielsen, Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Bill Taylor, NAVFAC SE Public Works Department Environmental
- Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE Public Works Department Pensacola
- Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc.
- Mr. Jeff Halstead, Exhibit Specialist, Fort Pickens State Park
- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park
- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

Visual surveys of the OLF Bronson Field Skeet Range and Pistol Range were conducted on 29 November 2007 during the PA site visit. Malcolm Pirnie team members Ms. Susan Burtnett, Ms. Angela Nolan, and Mr. Dan Hains were present. The purpose of the visual surveys were to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site.

The visual surveys consisted of walking the perimeter of the ranges to determine the presence/absence of MEC and MC along the periphery of the site. The OLF Bronson Field Skeet Range is located in an undeveloped area approximately 400 feet southeast of OLF Bronson Field Runway 4 and 500 feet west of Runway 36. The Pistol Range berm is located approximately 200 feet south of the Skeet Range. The

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majority of this region is covered with thick brush and mature trees, and a wetland habitat in the southern portion of the area where the Pistol Range is located. A shallow drainage channel runs north to south across the western portion of the immediate area, and there are no structures on site or in the immediate vicinity. Fragments of clay targets were observed in the northwestern and northeastern corners of the OLF Bronson Field Skeet Range. Fragments were also observed northwest of the range area. The OLF Bronson Field Pistol Range has a vegetated earthen berm located to the south of the Skeet Range. The berm was observed during the visual survey; however, it was inaccessible due to standing water and thick vegetation in the wetlands. Four pintle mounts are located approximately 100 feet to the north of the berm. No historical documentation has been discovered that links the pintle mounts to either the Skeet Range or Pistol Range. No MEC, munitions debris, or bullets/bullet fragments were observed during the visual survey. No structures exist at the site or in the immediate vicinity.



Figure 3: View of pintle mount

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Figure 4: View of OLF Bronson Field wetlands with berm in background

Documents and Reports:

- Information Booklet Containing Matters of General Interest, List of Activities and Facilities, correct as of 2 September 1945
- Memorandum from the Commander, Naval Air Training Bases to the Chief of the Bureau of Yards and Docks discussing the request for purchase of surplus buildings 1609, 1742, 1743, 1744, and 1145 by St. Anne's Catholic Chapel of Pensacola, Florida, 20 July 1948
- Memorandum from the Chief of the Bureau of Yards and Docks to the Commander, Naval Air Training Bases discussing the demolition and removal of 35 structures on Outlying Field, Bronson Field, 8 June 1950
- Preliminary Assessment Report, Outlying Landing Field (OLF) Bronson, Escambia County, Florida, February 1992
- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Contamination Assessment Report, U.S. Navy Outlying Landing Field (OLF) Bronson, Site 1116, Pensacola, Florida, March 1997
- Site Characterization Report for Sites 100 and 102, Outlying Landing Field Bronson, Pensacola, Florida, May 2001
- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010
- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004
- Final Integrated Cultural Resources Management Plan, NAS Pensacola, Escambia County, Volume 1, February 2004

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- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006
- Final Preliminary Assessment, Naval Air Station Pensacola, Florida, August 2007

Websites:

- <http://www.naspensacola.navy.mil> (Installation Information)
- <http://www.pafw.com/bronson.htm> (Installation Information)
- <http://www.nps.gov> (Regional Information)
- <http://www.usgs.gov> (Regional Information)
- <http://ns.gov.gu> (Regional Information)
- <http://geocities.com> (Regional/Demographics Information)
- <http://census.gov> (Demographics Information)
- <http://fws.gov> (Threatened and Endangered Species Information)

Maps:

- Map of Bronson Field Naval Air Station Pensacola, Florida, Showing Conditions on June 30, 1942
- Map of Bronson Field Naval Air Station Pensacola, Florida, Showing Conditions on June 30, 1943
- Map of Bronson Field Naval Air Station Pensacola, Florida, Showing Conditions on June 30, 1944
- Map of Bronson Field Naval Air Station Pensacola, Florida, Showing Conditions on June 30, 1946
- Map of Bronson Field Naval Air Station Pensacola, Florida, Showing Conditions on June 30, 1948
- Map of Bronson Field Naval Air Station Pensacola, Florida, Showing Conditions on June 30, 1949

The historical records found at the National Archives provided information regarding the OLF Bronson Field Skeet Range and Pistol Range. In addition, the interviews with Navy personnel provided valuable information about the ranges. The Skeet Range and Pistol Range berm were shown on maps dated 1943 through 1949, and records containing the general history of OLF Bronson Field and its use as a Navy pilot training facility were reviewed. Previous assessments of OLF Bronson Field have been conducted and include a 1992 Preliminary Assessment (PA), a 1997 Phase I Environmental Site Assessment, and a 2001 Site Characterization Report Investigation, all of which did not discuss the Skeet Range and Pistol Range investigated in this PA. The only historical document that mentioned the Skeet Range and Pistol Range was the 1945 document that summarized NAS Pensacola activities and facilities. With the exception of the above-mentioned archives, the location and layout of the Skeet Range and Pistol Range, previous sampling data, and potential migration pathway analyses were not identified or discussed in any other documents.

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Information Profiles

Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	OLF Bronson Field Skeet Range and Pistol Range
Range/Site Location	OLF Bronson Field is located on the east side of Perdido Bay, approximately five miles west of Pensacola, Florida and about one mile east of the Alabama border. The Skeet Range and Pistol Range are located within the southern boundary of the OLF.
Range/Site History	The ranges were shown on maps dated 1943 through 1949. No other information regarding the range histories was located.
Range/Site Area and Layout	The OLF Bronson Field Skeet Range is located approximately 400 feet to the southeast of OLF Bronson Field Runway 4 and approximately 500 feet to the west of Runway 36. The berm for the OLF Bronson Field Pistol Range is located approximately 200 feet south of the OLF Bronson Field Skeet Range. The site, which includes the Skeet Range and Pistol Range, is approximately 47.6 acres.
Range/Site Structures	A skeet range house used for storage (Building 1145) and four structures that appear to be high/low skeet houses were denoted on historical maps dating 1943 to 1949; however, no evidence of these buildings was observed during the visual site surveys conducted in January and November of 2007. The OLF Bronson Field Pistol Range has a large earthen berm approximately 330 feet in length, 90 feet in width, and 8 feet high. No other structures exist at the site or in the immediate vicinity.
Range/Site Boundaries	N: Thickly vegetated undeveloped area, Airfield S: Wetlands, thickly vegetated undeveloped area W: Thickly vegetated undeveloped area E: Thickly vegetated undeveloped area, Airfield
Range/Site Security	The OLF Bronson Field Skeet Range and Pistol Range are accessible by the public; however, thick vegetation limits accessibility to the majority of the former ranges.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	Specific ordnance types used at the ranges were not documented; however, typical small arms used for practice at skeet ranges are 12-gauge shotguns, and .22, .38, and .45 caliber and 9 mm rounds are typically used at pistol ranges.
Maximum Probability Penetration Depth	Pellets dispersed from a shotgun used at the OLF Bronson Field Skeet Range would be deposited on the ground surface and would not penetrate the ground surface unless disturbed. Maximum penetration depth for the backstop berm for the OLF Bronson Field Pistol Range is 12 inches.
MEC Density	Based on historical documentation, the OLF Bronson Field Skeet Range and Pistol Range were used only for small arms training. MEC are not suspected to be present at the site.
Munitions Debris	Fragments of clay targets were observed in both the northwest and northeast corners of the OLF Bronson Field Skeet Range. No evidence of munitions debris was identified during the visual survey in the vicinity of the Pistol Range berm or pintle mounts.
Associated Munitions Constituents	<p>The primary MC associated with small arms ammunition is lead. Other MC may include antimony, arsenic, copper, zinc and constituents associated with black and/or smokeless powder; however, these constituents are less likely to be of concern as they are either present in only minor concentrations or are typically consumed when the small arms ammunition is fired.</p> <p>Clay pigeons were likely used as targets at the Skeet Range. Clay targets are typically bound together with petroleum products that contain polycyclic aromatic hydrocarbons (PAHs). Although PAHs are an associated MC, they tend to be tightly bound in the petroleum pitch and limestone matrix of the target and are therefore not readily available to the environment.</p> <p>No soil sampling regarding MC has been conducted at the site and no groundwater samples collected at nearby wells up-gradient of the site showed MC concentrations above Florida Department of Environmental Protection (FDEP) Groundwater Cleanup Target Levels (GCTLs).</p>

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Migration Routes/Release Mechanisms	Migration of MC from the OLF Bronson Field Skeet Range and Pistol Range may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake.

Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Climate	The climate at OLF Bronson Field is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.
Topography	OLF Bronson Field resides in the Coastal Lowland topographic division of the Coastal Plain physiographic division of the U.S. The Coastal Lowlands consist of relatively undissected, nearly level plains that lie less than 100 feet above mean sea level (msl). Elevation of OLF Bronson Field ranges from 20 to 30 feet above msl along a northwestern terrace on the property to sea level along the western portion of the property. With a few exceptions along the northwest corner of the property, topography is level to gently sloping (less than 8% slope). The Skeet Range and Pistol Range, which are located in the southern portion of OLF Bronson Field, are located in a relatively flat area surrounded by wetlands.

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Geology	<p>The Skeet Range and Pistol Range are located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface (bgs), and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).</p>
Soil	<p>According to the Soil Survey for Escambia County, soils immediately surrounding the airfield are generally a loamy, friable, loose sand that has somewhat poor drainage (USDA, 2004). The areas to the south and southwest of the airfield, where the Skeet Range and Pistol Range are located, are characterized by poorly-drained sandy soils and muck, and the areas to the north and northwest are characterized by loose sand with excessive drainage (USDA, 2004). Surface sediments in the OLF Bronson Field area are classified as Croatan, Foxworth, Hurricane, Lakeland, Leon, Pickney, and Pottsburg sands, as well as Urban Land and Depressional associations (USDA, 2004). Specifically, the Skeet Range and Pistol Range contain the Hurricane and Pottsburg sands, as well as the Croatab Muck Depressional.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWFMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWFMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWFMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for NAS Pensacola and OLF Bronson Field is a well field located at Naval Technical Training Center Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>Depth to groundwater at the Skeet Range and Pistol Range is approximately two feet bgs. Information from monitoring wells installed in September and November of 1999 for a Site Characterization Report, and located just to the northwest and up-gradient of the former ranges, showed no acetone, volatile organic carbons, semi-volatile organic carbons, or inorganics at concentrations above FDEP GCTLs.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrology	<p>OLF Bronson Field consists of generally flat terrain with surface drainage flowing by way of sheet flow towards a large wetland area located to the south and southwest, where the Skeet Range and Pistol Range are located. The wetlands area drains into Perdido Bay, located approximately 0.8 miles to the west. Swampy areas exist in the south central portion of the property, where the Skeet Range and Pistol Range are located, as well as in the extreme northwest and northeast corners. There are no known major surface water consumptive uses within the area.</p>
Vegetation	<p>OLF Bronson Field is covered by paved runways surrounded by grassy fields, wooded areas, wetlands, and Perdido Bay. The area surrounding the Skeet Range and Pistol Range is predominantly wooded and supports a wide variety of plant species typical of humid subtropical climates. Slash (<i>Pinus elliottii</i>) and longleaf pines (<i>Pinus palustris</i>) are the most abundant species in the area. Along with the pines, trees such as oaks (<i>Quercus</i> Spp.), willows (<i>Salix</i> Spp.), magnolias (<i>Magnolia</i> Spp.), hickories (<i>Carya</i> Spp.), and gums (various genera) grow naturally in the area.</p> <p>Several plant species listed as threatened or endangered by state or federal agencies have been observed at OLF Bronson Field, including: trailing arbutus (<i>Epigaea repens</i>), heartleaf (<i>Hexastylis arifolia</i>), mountain laurel (<i>Kalmia latifolia</i>), panhandle lily (<i>Lilium iridollae</i>), large-leaved jointweed (<i>Polygonella macrophylla</i>), orange azalea (<i>Rhodoendron austrinum</i>), white-top pitcher plant (<i>Sarracenia leucophylla</i>), red-flowered pitcher plant (<i>Sarracenia rubra</i>), silky camellia (<i>Stewartia malacodendron</i>).</p>

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Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	The OLF Bronson Field Skeet Range and Pistol Range are currently closed and have no designated or future planned land uses.
Current Human Receptors	Current human receptors include Navy personnel/visitors, off-site workers/residents, and trespassers/hikers. Navy personnel include individuals involved with helicopter training in the area or those working at the MWR facility. Visitors may include individuals participating in recreational activities with the MWR facility. Trespassers/hikers include civilian campers, hikers, or naturalists who can access the site from Perdido Bay.
Current Activities (frequency, nature of activity)	Frequent activities are anticipated for Navy personnel/visitors and infrequent activities are expected for trespassers/hikers. Navy personnel may access the site during helicopter training or while conducting recreational activities with visitors of the MWR facility, such as camping or hiking. Trespassers/hikers may access the site to camp, fish, or explore.
Potential Future Land Use	No change in land use is planned.
Potential Future Human Receptors	No potential for future human receptors is anticipated beyond the current receptors, as no change in land use is planned.
Potential Future Land Use Related Activities	No future land use related activities are anticipated.
Zoning/Land Use Restrictions	There are no zoning/land use restrictions at the OLF Bronson Field Skeet Range and Pistol Range.
Beneficial Resources	Two sites were identified as “potentially eligible” for the National Register of Historic Places in a 1995 and 1996 archaeological investigation of OLF Bronson Field (ICRMP, 2004). The sites contained ceramic artifacts and shards, midden stained sediment deposits, and architectural features from Pre-historic, Second Spanish Colonial, British period, Early American, and/or 19 th and 20 th Century American times. No beneficial resources were specifically located at the OLF Bronson Field Skeet Range or Pistol Range.
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (2000 Census). Approximately 14,720 civilian and military personnel are employed at NAS Pensacola (INRMP, 2001).

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Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	The area surrounding the Skeet Range and Pistol Range is predominantly wooded and supports a wide variety of plant species typical of humid subtropical climates. Slash and longleaf pines are the most abundant species in the area. Along with the pines, trees such as oaks, willows, magnolias, hickories, and gums grow naturally in the area.
Degree of Disturbance	The current and future land uses of the OLF Bronson Field Skeet Range and Pistol Range result in a low degree of disturbance to the habitat or ecological receptors.
Ecological Receptors	Terrestrial ecological receptors may include mammals (e.g., foxes, bears, and squirrels), reptiles (e.g., tortoises), terrestrial plants, and a variety of bird species. Aquatic ecological receptors in nearby surface water may include various species of fish, amphibians, and aquatic/wetland vegetation. Currently, threatened or endangered species possibly inhabiting the OLF Bronson Field Skeet Range and Pistol Range include the Eastern indigo snake (<i>Drymarchon coureus couperi</i>), Arctic peregrine falcon (<i>Falco peregrinus tundrius</i>), southeastern kestrel (<i>Falco sparverius paulus</i>), bald eagle (<i>Haliaeetus leucocephalus</i>), wood stork (<i>Mycteria americana</i>), and the Florida black bear (<i>Ursus americanus floridanus</i>).
Relationship of MEC/MC Sources to Habitat and Potential Receptors	Flora may bioaccumulate MC in surface and/or subsurface soil, via plant uptake. Fauna may be exposed to MC in surface soil through ingestion, dermal contact, and inhalation or by ingesting vegetation or prey organisms that may bioaccumulate MC.

Graphical Presentations

The attached Munitions Characterization Map and Exposure Pathway Analysis Figures provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Historical and visual evidence indicate that MEC are not present at the site; therefore, there are no complete exposure pathways for MEC. As such, Exposure Pathway Analysis Figures for MEC were not created. However, information obtained and visual observations indicate that the potential for MC exists.

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The Exposure Pathway Analysis figures provide a summary of complete, potentially complete, and incomplete exposure pathways for MC. For MC, interaction between the source (e.g., the berm) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

MC Exposure and Pathway Analysis

The pathway analyses for MC at the OLF Bronson Field Skeet Range and Pistol Range are shown in Figure 5. Potential receptors include both human (Navy personnel [including MWR employees], visitors [including off-duty Navy personnel], and trespassers/hikers) and ecological (biota) receptors that may come in contact with MC in the source medium or other potentially contaminated media from the site. Pathways are shown for each exposure medium and are discussed below.

Surface Water/Sediment: Because of the wetland area in the southern portion of the site and the small natural drain in the western portion of the site, MC may migrate between interconnected surface water bodies and from soil to surface water/sediment through surface water runoff. Due to the fact that the adjacent airfield is used by Combat Support Squadron 16 helicopters for training, and that recreational activities such as camping or hiking occur within the area, potential receptors include Navy personnel involved in helicopter training or working at the MWR facility; visitors of the MWR facility participating in recreational activities; trespassers/hikers exploring the area; and aquatic and terrestrial biota that forage in the sediment and/or ingest surface water. Potentially complete exposure pathways exist throughout the site for biota via incidental ingestion and dermal contact, and for Navy personnel/visitors and hikers/trespassers via dermal contact. MC in surface water/sediment may also bioaccumulate, and biota and trespassers/hikers that may catch and consume fish could potentially be exposed to MC through the food chain.

Surface Soil (0-2 feet): MC may be present in the surface soil at the Pistol Range from bullets that were fired around and into the Pistol Range berm. For the Skeet Range, MC may be present in the surface soil from shot fall within the range and from clay fragments. Due to the fact that the adjacent airfield is used by Combat Support Squadron 16 helicopters for training, and that recreational activities such as camping or hiking occur within the area, potential receptors include Navy personnel involved in helicopter training or working at the MWR facility; visitors of the MWR facility participating in recreational activities; trespassers/hikers exploring the area; biota that construct burrows or forage on the former ranges; and threatened or endangered plant species that may exist on site, which have root systems in the surface soil. Potentially complete exposure pathways exist throughout the site for these receptors via incidental ingestion and dermal contact. Inhalation is not considered to be a potentially complete pathway due to the presence of on-site surface water bodies, high soil moisture, and high vegetative cover, which can inhibit the generation and transport of dust.

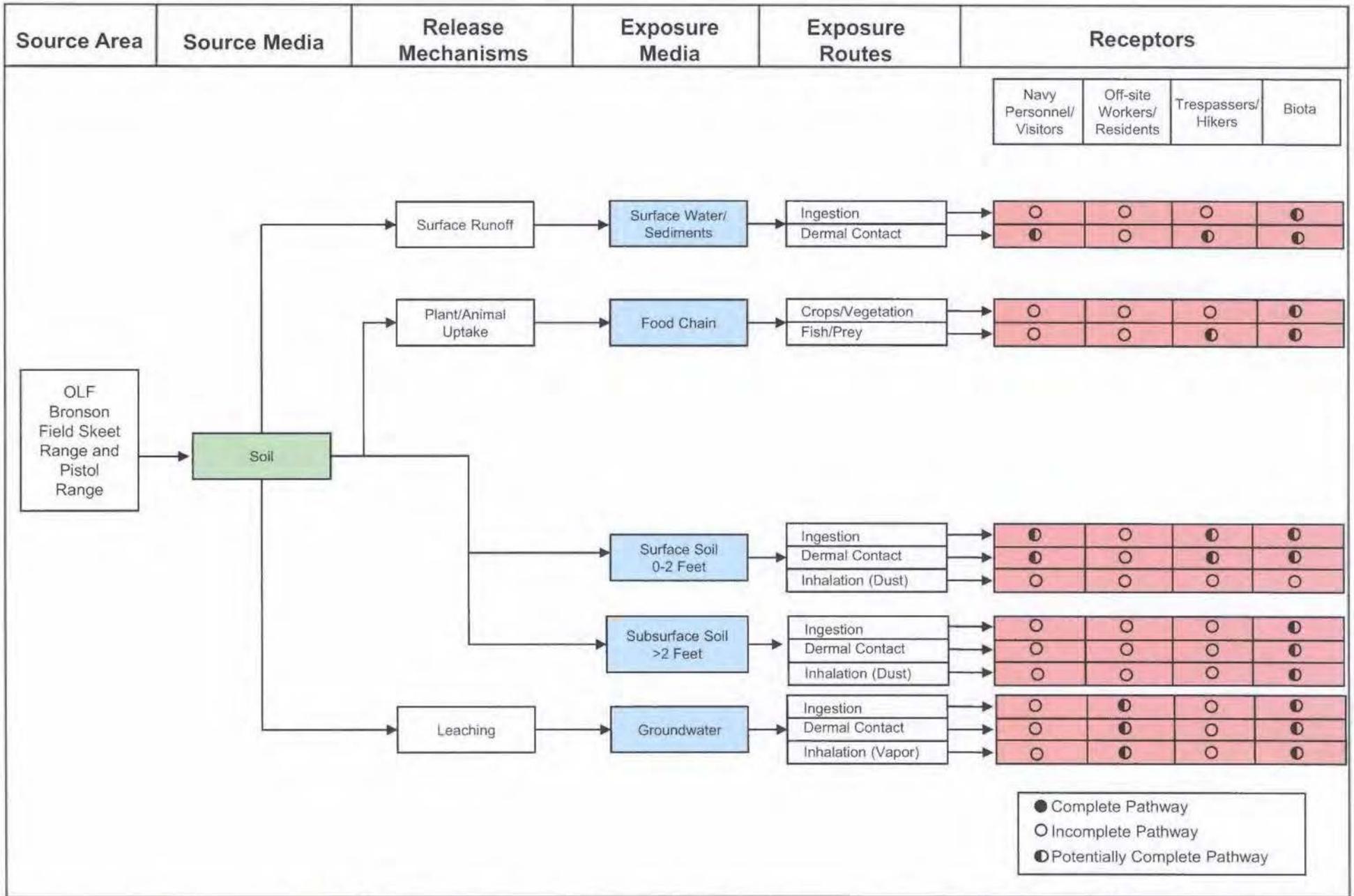
Subsurface Soil (>2 feet): MC may be present in subsurface soil at both ranges due to migration from the overlying surface soil via leaching mechanisms. Biota may be exposed to MC in subsurface soil while constructing burrows; therefore, potentially complete exposure pathways exist for this receptor via incidental ingestion and dermal contact. Inhalation is not considered to be a potentially complete pathway

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due to the presence of on-site surface water bodies, high soil moisture, and high vegetative cover, which can inhibit the generation and transport of dust. Since future environmental investigations and underground utility installation have not been identified or anticipated for Navy personnel, and since no digging or excavating is warranted for Navy personnel/visitors or trespassers/hikers participating in recreational activities at the site, no potentially complete pathways exist for these receptors.

Groundwater: Depth to groundwater at the OLF Bronson Field Skeet Range and Pistol Range is approximately two feet bgs. Due to the semi-confining unit within the Sand-and-Gravel Aquifer, vertical flow between the surface and the main producing zone of the aquifer, where the Corry Station production wells are located, is restricted; therefore, MC migration into the main producing zone of the Sand-and-Gravel aquifer and subsequently into the production wells at Corry Station is not likely. However, groundwater within the surficial zone of the Sand-and-Gravel Aquifer could potentially be used via private wells for consumption or irrigational purposes; therefore, groundwater exposure pathways are considered to be potentially complete for off-site receptors that are located down-gradient from the site. In addition, due to the shallow nature of groundwater at the site and the consequent ease of exposure, groundwater exposure pathways are considered to be potentially complete for burrowing biota and for any threatened or endangered plant species that may exist on site.

Food Chain: MC in soil may accumulate in plants, which can subsequently be consumed by animals foraging on the ranges or consumed by fish in on-site surface waters. Predation of prey and/or consumption of vegetation on the Skeet Range and Pistol Range, or fish in on-site surface waters, may result in bioaccumulation of MC. Potentially complete exposure pathways are identified for biota that may be exposed to MC through the food chain, and for trespassers/hikers who may fish in the on-site water bodies.



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**MALCOLM
PIRNIE**

Munitions Characterization
OLF Bronson Field Skeet Range and Pistol Range

Legend

- Installation Boundary
- Range Boundary
- Site Boundary
- Surface Danger Zone
- Historical Site Features
- Firing Line
- Berm
- Clay Fragments
- Pintle Mounts
- MEC Presence***
- Known
- Suspect

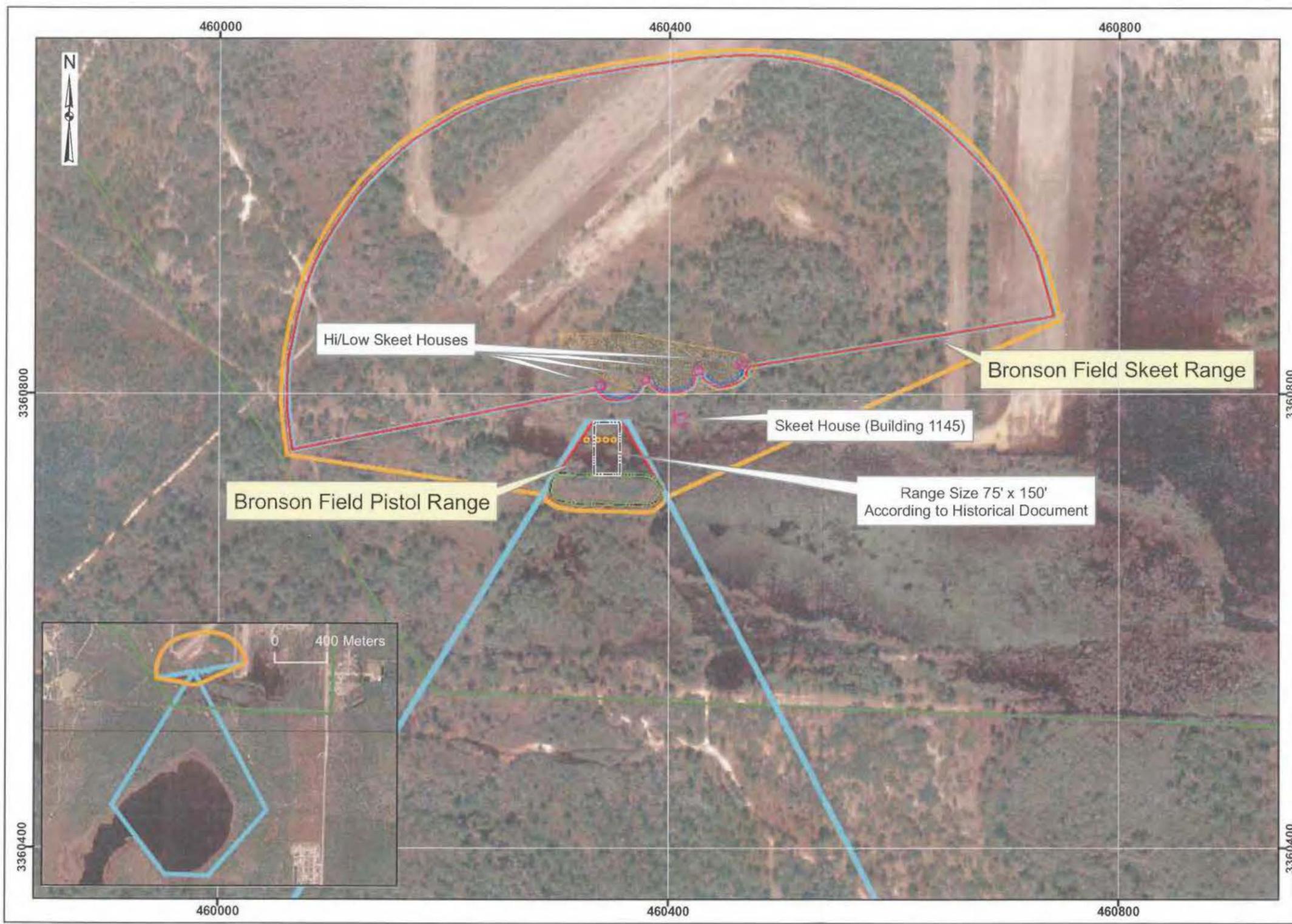
*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.



Data Source: NAS Pensacola, GIS Data, 2007
Map of Bronson Field Naval Auxiliary
Air Station Pensacola, FL Showing
Conditions on June 30, 1943

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
Edition: Interim Conceptual Site Model
Date: July 2008



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Preface

This interim deliverable provides the Navy with a summary of information collected to date and the data sources used to support the Conceptual Site Model (CSM). It summarizes our current understanding of the site, presented in the attached Information Profiles. It also provides draft Graphical Presentations of the site layout and CSM. The Information Profiles and the Graphical Presentations will serve as the basis of the CSM section of the Preliminary Assessment (PA) Report.

This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. The Bayou Grande bay intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center; Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

Corry Station is a 604-acre airfield with four inactive runways. The station honors Medal of Honor winner LCDR William M. Corry Jr., who died as a result of burns received while attempting to rescue a fellow officer from a crashed and burning aircraft. Corry Station is in the westernmost part of the Florida panhandle, and lies five miles west of downtown Pensacola and two miles north of NAS Pensacola. Naval

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Technical Training Center (NTTC) Corry Station occupies the largest portion of the area (431.5 acres or 72 percent), with the remainder of the property being occupied by the following: the Naval Hospital (42.5 acres), family housing (88.5 acres), and the Navy Shopping Mall (41.7 acres). The original Corry Field (currently known as Corry Station) had its beginning in 1923 in a remote area north of Pensacola, with relocation to its present site in 1928. In 1932, construction of hard-surfaced runways, hangars, and other buildings transformed Corry Field into a first-class training field, one of the first airfields in the U.S. to be hard-surfaced. The new Corry Field consisted of two separate fields, each with three asphalt runways, the longest runways being 4,200 feet in length. In the years preceding U.S. entry into World War II (WWII), primary flight training, fighter training, and multi-engine land-plane training were conducted at Corry Field. In 1943, the airfield was re-designated as Naval Auxiliary Air Station (NAAS) Corry Field, continuing to serve as a training center for aviators through WWII and during the Korean conflict, until its decommissioning in 1958. Operations at the airfield changed from flight training to technical training in 1960, when the first class of communications technicians (later known as cryptologic technicians) arrived and the training school was established. To reflect this change, the Chief of Naval Operations changed the name of Corry Field to NTTC, Corry Station in 1973. The assigned mission of NTTC is to administer those schools assigned by the Chief of Naval Education and Training to train officers and enlisted personnel of the Navy and personnel of other services and agencies in cryptology, electronic warfare, photography and optical and instrument repair. The Naval Aerospace and Regional Medical Center was established in the southwest quadrant of Corry Station in March of 1976. This command was re-designated as the Naval Hospital, Pensacola in March of 1983. The family housing lies in the southeast corner of Corry Station, with housing limited to 200 enlisted-family units.



Figure 1: Aerial photograph of Corry Station

The Corry Station Skeet Range is located approximately 300 feet to the west of Corry Station Runway 16, between Runways 11 and 7. The total acreage within the range boundary designated for the Corry Station Skeet Range is approximately 35.3 acres, and includes the Skeet Range boundary, as well as its Surface Danger Zone (SDZ) (see attached ICSM site map). The range is denoted on historical maps dated 1947,

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1948, 1951, and on an undated map obtained from the National Archives. The Skeet Range is also mentioned in a 1945 document that summarizes activities and facilities at NAS Pensacola. According to current maps and discussions with NAS Pensacola personnel, the range was a multiple field skeet range with up to three fields, and the Naval Hospital Pensacola complex at Corry Field overlies a major portion of the former range. The Naval Hospital was constructed in 1975, and NAS Pensacola personnel that were interviewed were unaware of any records of the Skeet Range having been addressed during construction activities. No additional information regarding munitions use associated with this range was obtained during the archival data search.

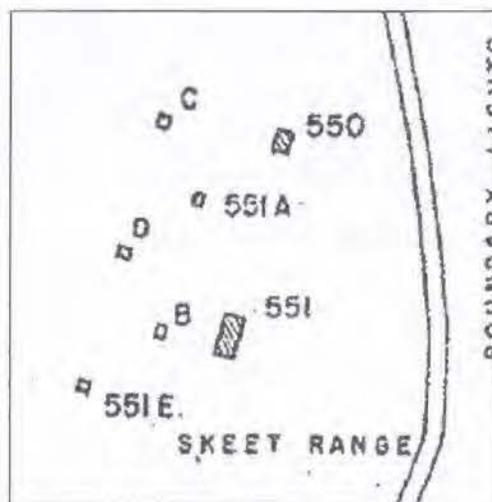


Figure 2: Skeet Range and on-site buildings according to a 1951 map of Corry Field

The Corry Station Firing Range is denoted on one undated proposed master land use plan obtained from the National Archives; however, the range was hand-sketched, and its validity is questionable. The location of this range is shown to overlie the intersection of Runways 11 and 16. No evidence of a historical berm for the Firing Range was identified; therefore, the total acreage within the range boundary designated for the Corry Station Firing Range is approximately 196.6 acres, and includes the hand-sketched depiction of the Firing Range boundary, as well as its SDZ (see attached ICSM site map). Currently, the former range is overlain by the new Army Reserve Center, which began construction in 2008. The U.S. Army Corps of Engineers (USACE) handled the contract management for the Center's construction. NAS Pensacola personnel were not informed by the USACE of any reported munitions (e.g., bullets/bullet fragments) or range features found during construction activities. The undated map was created sometime between 1932 and 1975, as it depicts the "Proposed Hospital" sketched-area to the south of the range, and the range is sketched in over a map with existing hard-surfaced Corry Field runways. Based upon valid historical data, the existence of the Firing Range is deemed unlikely since firing ranges are not typically constructed over paved runways. No additional information regarding munitions use associated with this range was obtained during the archival data search.

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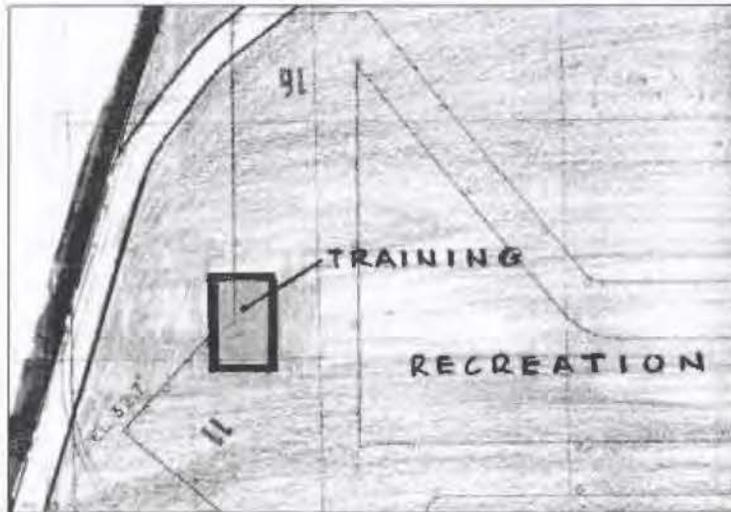


Figure 3: Sketched depiction of Corry Station Firing Range (undated)

The 1945 historical document obtained during the archival data search mentions a pistol range in addition to the Skeet Range at Corry Station; however, no additional information regarding the pistol range was available from the archival data obtained during the archival data search.

This ICSM addresses the area within the site boundary (approximately 231.6 acres), which includes the range boundaries for the Corry Station Skeet Range and Firing Range, as well as any excess area between the two former ranges; therefore, the sum of the acreage within the range boundaries is less than the total acreage within the site boundary.

Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
- National Museum of Naval Aviation
- Historical Map Files, Building 458

Personal Interviews:

- Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department
- Mr. Jim Kane, Deputy Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Steve Ward, Real Property Management, NAVFAC SE Public Works Department Pensacola

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- Commander Kristine Nielsen, Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Bill Taylor, NAVFAC SE Public Works Department Environmental
- Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE Public Works Department Pensacola
- Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc.
- Mr. Jeff Halstead, Exhibit Specialist, Fort Pickens State Park
- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park
- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

Visual surveys of the Corry Station Skeet Range and Firing Range were conducted on 30 November 2007 during the site visit. Malcolm Pirnie team members Ms. Susan Burnett, Ms. Angela Nolan, and Mr. Dan Hains were present. The purpose of the visual surveys were to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), any evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site.

Approximately 50 percent of the range boundaries for the Corry Station Skeet Range and Firing Range are currently located in a developed area within Corry Station. The remaining portions of the site are within a residential community located off the installation and to the west of the Corry Station airfield. The Naval Hospital Material Management Department Building and parking lot cover approximately 50 percent of the portion of the Skeet Range that is located within the installation, while the remaining area is covered with a baseball field bordered to the east by a wooded area. Clay target fragments were observed within the range boundary of the Skeet Range, with higher concentrations along the north face of the hospital building, in the wooded area, and along the fence line on the western boundary of the installation. No MEC was observed at the Skeet Range. An Army Reserve Center is currently being constructed over approximately 90 percent of the portion of the Corry Station Firing Range that is located within the installation; the northwest corner of the site has remained undeveloped. A construction supervisor for the USACE stated 4 feet to 8 feet of soil was excavated during the construction of the Reserve Center, but no evidence of former range activities was observed. No MEC or munitions debris was observed during the visual survey of the Firing Range.

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Figure 4: View of Army Reserve Center at former Firing Range.



Figure 5: View of Naval Hospital building and parking lot.

Documents and Reports:

- Information Booklet Containing Matters of General Interest, List of Activities and Facilities, correct as of 2 September 1945
- Preliminary Assessment Report, Naval Technical Training Center Corry Station, Escambia County, Florida, January 1992
- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010
- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001

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- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004
- Final Integrated Cultural Resources Management Plan, NAS Pensacola, Escambia County, Volume 1, February 2004
- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006
- Final Preliminary Assessment, Naval Air Station Pensacola, Florida, August 2007

Websites:

- <http://www.naspensacola.navy.mil> (Installation Information)
- <http://www.pafw.com/corry.htm> (Installation Information)
- <http://www.globalsecurity.org> (Installation Information)
- <http://www.nps.gov> (Regional Information)
- <http://www.usgs.gov> (Regional Information)
- <http://ns.gov.gu> (Regional Information)
- <http://geocities.com> (Regional/Demographics Information)
- <http://census.gov> (Demographics Information)
- <http://fws.gov> (Threatened and Endangered Species Information)

Maps:

- Map of Outlying Landing Fields, Naval Air Station, Pensacola, Florida, Showing Conditions on June 30, 1941
- Map of Corry Field, Naval Air Station, Pensacola, Florida, Showing Conditions on June 30, 1941
- Map of Outlying Naval Activities, Naval Air Station, Pensacola, Florida, Showing Conditions on June 30, 1942
- Map of Corry Field, Naval Auxiliary Air Station, Pensacola, Florida, Showing Conditions on June 30, 1943
- Map of N.A.S. Pensacola, (Corry Field) Pensacola, Florida, Showing Conditions on June 30, 1947
- Map of Naval Auxiliary Air Station, Corry Field, Pensacola, Florida, 1948
- Map of Corry Field, Naval Auxiliary Air Station, Pensacola, Florida, Showing Conditions on June 30, 1951
- NTTC Corry Station General Development Map, 1995
- Master Shore Station General Development Plan, Proposed Master Land Use Plan, undated

Aerials

- Oblique View of Corry Field, NAS Pensacola, Florida, 2 October 1924
- Oblique View of Corry Field, NAS Pensacola, Florida, June 1926
- U.S. Naval Air Station, Pensacola, Florida, Corry Field Looking North, 29 October 1935
- Vertical Photo of Corry Field, Pensacola, Florida, 24 October 1939
- Corry Field, Auxiliary Station of NAS Pensacola, 3 March 1943
- Corry Field, Auxiliary Station of NAS Pensacola, Oblique Looking North, 10 March 1943
- Oblique of NAS Corry, Florida, Looking North, 7 January 1944

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The historical records found at the National Archives provided information regarding the Corry Station Skeet Range and Firing Range. The Skeet Range was shown on maps dated 1948 through 1951, and on an undated map. The Firing Range was denoted on the undated map, as well; however, the range was hand-sketched and its validity is questionable. In addition, the interviews with Navy personnel provided valuable information about the ranges. Previous assessments of Corry Station include a 1992 PA, which did not discuss the Skeet Range and Firing Range being investigated in this PA. The Skeet Range was mentioned in a 1945 document that summarizes activities and facilities at NAS Pensacola. With the exception of the above mentioned maps and documents, the location and layout of the Skeet Range and Firing Range, previous sampling data, and potential migration pathway analyses were not identified or discussed in any other documents.

Information Profiles

Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	Corry Station Skeet Range and Firing Range
Range/Site Location	Corry Station is located five miles west of downtown Pensacola and two miles north of NAS Pensacola in Escambia County, Florida. It lies 3.3 miles southeast of Perdido Bay, 1.9 miles northwest of Pensacola Bay, and 1.4 miles north of the Bayou Grande. The Skeet Range and Firing Range are located in the westernmost portion of Corry Station, west of the airfield runways.
Range/Site History	The Skeet Range was shown on maps dated 1947 through 1951. An undated map denoted the Skeet Range and Firing Range. No other information regarding the range histories was available.
Range/Site Area and Layout	The Skeet Range is a 35.3-acre site located in the western portion of Corry Field, approximately 300 feet to the west of Runway 16, between Runways 11 and 7. The Firing Range is a 196.6-acre site located in the western portion of Corry Field, overlying the intersection of Runways 11 and 16; however, its true boundaries are unknown, and its existence is questionable.
Range/Site Structures	No range structures, including berms, exist at the site or in the immediate vicinity.

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Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Range/Site Boundaries	<p>N: Woods and grass, NTTC Corry Station well field</p> <p>S: Naval Hospital Material Management Department Building and parking lot</p> <p>W: Woods, Corry Station property boundary, off-installation residential homes</p> <p>E: Woods, airfield and runways</p>
Range/Site Security	A fence surrounds the airfield; however, access to the site is not directly restricted.

Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	Specific ordnance types used at the ranges were not documented; however, typical small arms used for practice at skeet ranges are 12-gauge shotguns, and .22, .38, and .45 caliber and 9 mm rounds are typically used at firing ranges.
Maximum Probability Penetration Depth	Pellets dispersed from a shotgun used at the Corry Station Skeet Range would be deposited on the ground surface and would not penetrate the ground surface unless disturbed. A berm is typically associated with a firing range for containment of munitions; however, no berm was identified in historical documentation or during the visual survey of the Firing Range. The maximum penetration depth for a backstop berm at a firing range is approximately 12 inches.
MEC Density	Based on historical documentation, the Corry Station Skeet Range and Firing Range were used only for small arms training. MEC is not suspected to be present at the sites.
Munitions Debris	Clay target fragments were observed within the range boundary of the Skeet Range, with higher concentrations along the north face of the hospital building, in the wooded area, and along the fence line on the western boundary of the installation. No evidence of munitions debris was identified during the visual survey of the Firing Range.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Associated Munitions Constituents	<p>The primary MC associated with small arms ammunition is lead. Other MC may include antimony, arsenic, copper, zinc and constituents associated with black and/or smokeless powder; however, these constituents are less likely to be of concern as they are either present in only minor concentrations or are typically consumed when the small arms ammunition is fired.</p> <p>Clay pigeons were used as targets at the Skeet Range. Clay pigeons are typically bound together with petroleum products that contain polycyclic aromatic hydrocarbons (PAHs). Although PAHs are an associated MC, they tend to be tightly bound in the petroleum pitch and limestone matrix of the target and are therefore not readily available to the environment.</p> <p>No sampling regarding MC has been conducted at the site.</p>
Migration Routes/Release Mechanisms	<p>Migration of MC from the Corry Station Skeet Range and Firing Range may occur due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake. Future construction, excavation, or other site work could also serve as a migration/release mechanism.</p>

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Naval Air Station Pensacola, Florida**

Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Climate	<p>The climate at Corry Station is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.</p>
Topography	<p>Corry Station resides in the Coastal Lowland topographic division of the Coastal Plain physiographic division of the U.S. The Coastal Lowlands consist of relatively undissected, nearly level plains that lie less than 100 feet above mean sea level (msl).</p> <p>Topography of Corry Station ranges in elevation from approximately 30 feet along a north-central terrace on the property to approximately 10 feet. Topography is level to gently sloping (less than eight percent slope).</p>
Geology	<p>The Skeet Range and Firing Range are located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface (bgs), and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Soil	<p>According to the Soil Survey for Escambia County, soils immediately surrounding the airfield, where the Skeet Range and Firing Range are located, are generally dark, acidic sands with some organics and poor drainage (USDA, 2004). The areas to the south and north of the airfield are characterized by poorly-drained loamy sands, while the central and eastern portions of the property are characterized by excessively-drained coastal sands (USDA, 2004). Surface sediments in the Corry Station area are classified as Hurricane, Lakeland, and Pickney, sands, as well as Urban Land and Arents, filled associations. Specifically, the Skeet Range and Firing Range contain the Pickney Sand.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWWMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWWMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWWMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for NAS Pensacola is a well field located at NTTC Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>Depth to groundwater at the Skeet Range and Firing Range is approximately three feet bgs. Information from monitoring of the NTTC Corry Station production wells in the 1992 PA showed the pesticide, dieldrin, at concentrations above Florida Department of Environmental Protection acceptable levels. Elevated levels of the pesticide were concluded to be due to nearby urban and residential lawn maintenance. No other information regarding groundwater quality in the area was identified.</p>

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Conceptual Site Model Information Profiles - Physical Profile	
Information Needs	Preliminary Information
Hydrology	<p>For most of Corry Station, runoff is generally towards the south and southwest through a network of culverts. Swampy areas exist in the south-central and southwestern portion of the property. The site lies 3.3 miles southeast of Perdido Bay, 1.9 miles northwest of Pensacola Bay, and 1.4 miles north of the Bayou Grande.</p> <p>No surface water features are located at the Skeet Range or Firing Range.</p>
Vegetation	<p>Parking lots or buildings currently overlie the former Skeet Range and Firing Range. Those areas that are undeveloped consist of a few wooded and grassy areas. At present, no record of sightings of threatened or endangered species have occurred at Corry Station.</p>

Conceptual Site Model Information Profiles - Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	<p>Approximately 50 percent of the range boundaries for the Corry Station Skeet Range and Firing Range are currently located in a developed area within Corry Station. The remaining portions of the site are within a residential community located off the installation and to the west of the Corry Station airfield. The Naval Hospital Material Management Department Building and parking lot cover approximately 50 percent of the portion of the Skeet Range that is located within the installation, while the remaining area is covered with a baseball field bordered to the east by a wooded area. An Army Reserve Center is currently being constructed over approximately 90 percent of the portion of the Corry Station Firing Range that is located within the installation; the northwest corner of the site has remained undeveloped.</p>
Current Human Receptors	<p>Current human receptors include Navy personnel/contractors, visitors, and trespassers. Navy personnel and visitors may access the site while visiting or working at the Army Reserve Center, Naval Hospital, or baseball field, and Navy personnel/contractors may access the site to perform or oversee construction activities. Trespassers can access the site from NTTC Corry Station.</p>

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Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Activities (frequency, nature of activity)	Current activities include frequent visitation to the Army Reserve Center, Naval Hospital, and baseball field by visitors and Navy personnel, as well as frequent construction activities for Navy personnel and contractors. Infrequent activity is anticipated at the site for building maintenance or repair; baseball field maintenance; utilities modification or installation; and trespasser access.
Potential Future Land Use	No change in land use is planned.
Potential Future Human Receptors	Potential future human receptors consist of the current receptors, as no change in land use is planned.
Potential Future Land Use Related Activities	Future land use related activities may include building maintenance or repair, baseball field maintenance, and/or utilities modification or installation.
Zoning/Land Use Restrictions	There are no zoning/land use restrictions at the Corry Station Skeet Range and Firing Range.
Beneficial Resources	There are no beneficial resources located at the Corry Station Skeet Range and Firing Range.
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (2000 Census). There were approximately 3,400 active-duty personnel at NTTC Corry Station in Fiscal Year 2007.

Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	The area surrounding the former ranges is predominantly covered in urban development. Undeveloped areas are composed of small wooded areas with some grass and shrubs.
Degree of Disturbance	The current land uses of the Skeet Range and Firing Range have resulted in a high degree of disturbance to the habitat or ecological receptors. No future disturbance is anticipated.
Ecological Receptors	Terrestrial ecological receptors may include mammals (e.g., foxes, bears, and squirrels), reptiles (e.g., tortoises), terrestrial plants, and a variety of bird species tolerant of urban development. Currently, there are no known threatened or endangered species on the Skeet Range and Firing Range.

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Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Relationship of MEC/MC Sources to Habitat and Potential Receptors	Flora may bioaccumulate MC in surface and/or subsurface soil, via plant uptake. Fauna may be exposed to MC in surface soil through ingestion, dermal contact, and inhalation or by ingesting vegetation or prey organisms that may bioaccumulate MC.

Graphical Presentations

The attached Munitions Characterization Map and Exposure Pathway Analysis Figures provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Historical and visual evidence indicate that MEC are not present at the site; therefore, there are no complete exposure pathways for MEC. As such, Exposure Pathway Analysis Figures for MEC were not created. However, information obtained and visual observations indicate that the potential for MC exists at the Corry Station Skeet Range.

The Exposure Pathway Analysis figures provide a summary of complete, potentially complete, and incomplete exposure pathways for MC. For MC, interaction between the source (e.g., lead shot on the ground surface or clay target fragments) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

MC Exposure and Pathway Analysis

The pathway analyses for MC at the Corry Station Skeet Range and Firing Range are shown on Figures 6 and 7, respectively. Potential receptors include both human (Navy personnel/contractor, visitor, off-installation resident, and trespasser) and ecological (biota) receptors that may come in contact with MC in the source medium or other potentially contaminated media from the site. Pathways are shown for each exposure medium and are discussed below. No potentially complete or complete pathways were identified for the Corry Station Firing Range due to the fact that its existence is in doubt; therefore, the following information only pertains to the Corry Station Skeet Range.

Surface Water/Sediment: MC may migrate from soil to surface water/sediment through surface water runoff. No surface water bodies exist at the site; therefore, there are no complete or potentially complete exposure pathways for any receptors.

Surface Soil (0-2 feet): MC may be present in the surface soil from shot fall within the range boundary and from clay fragments. Potential receptors include Navy personnel/contractors and visitors working in the area or visiting the Naval Hospital, Army Reserve Center, or baseball field; off-installation residents;

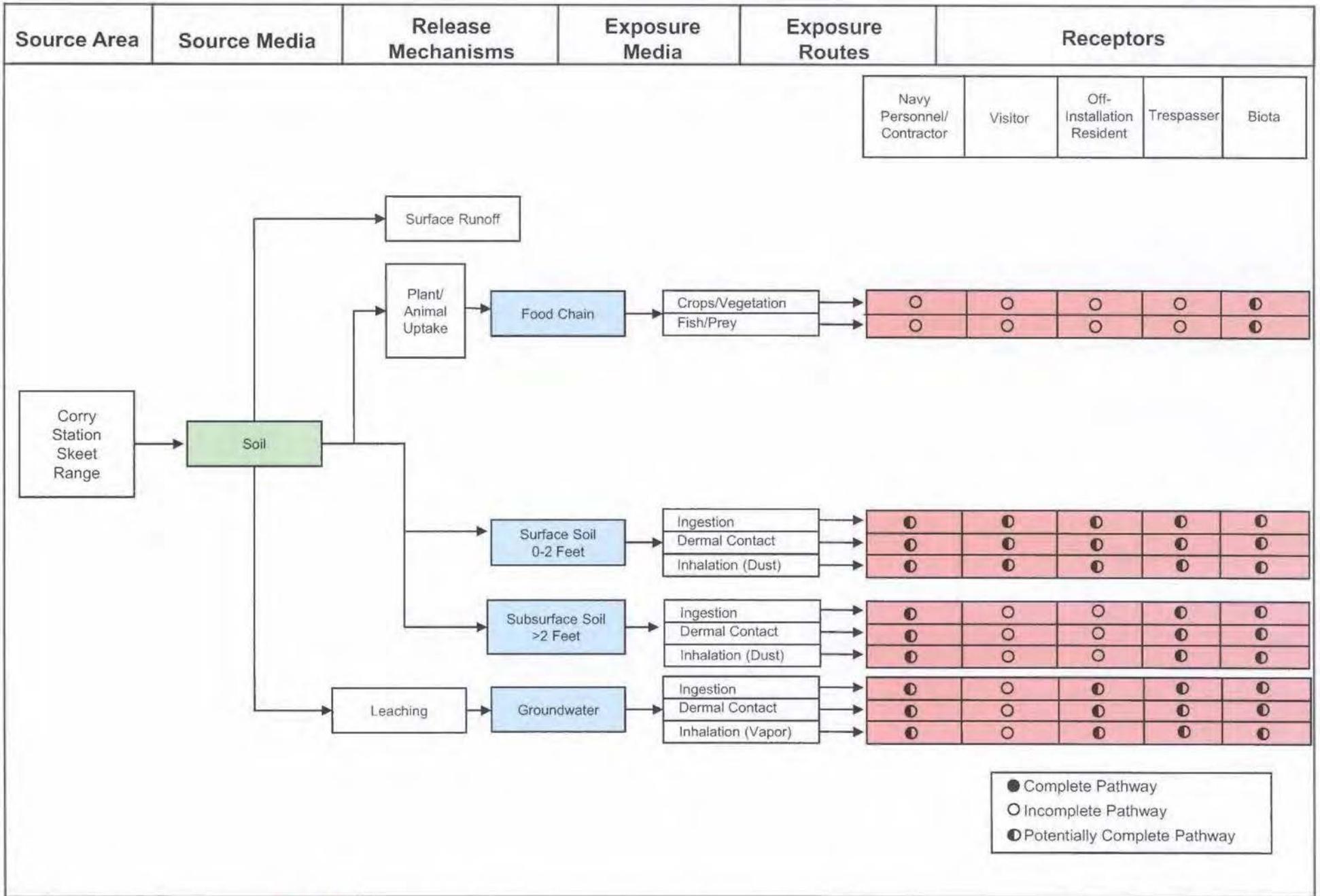
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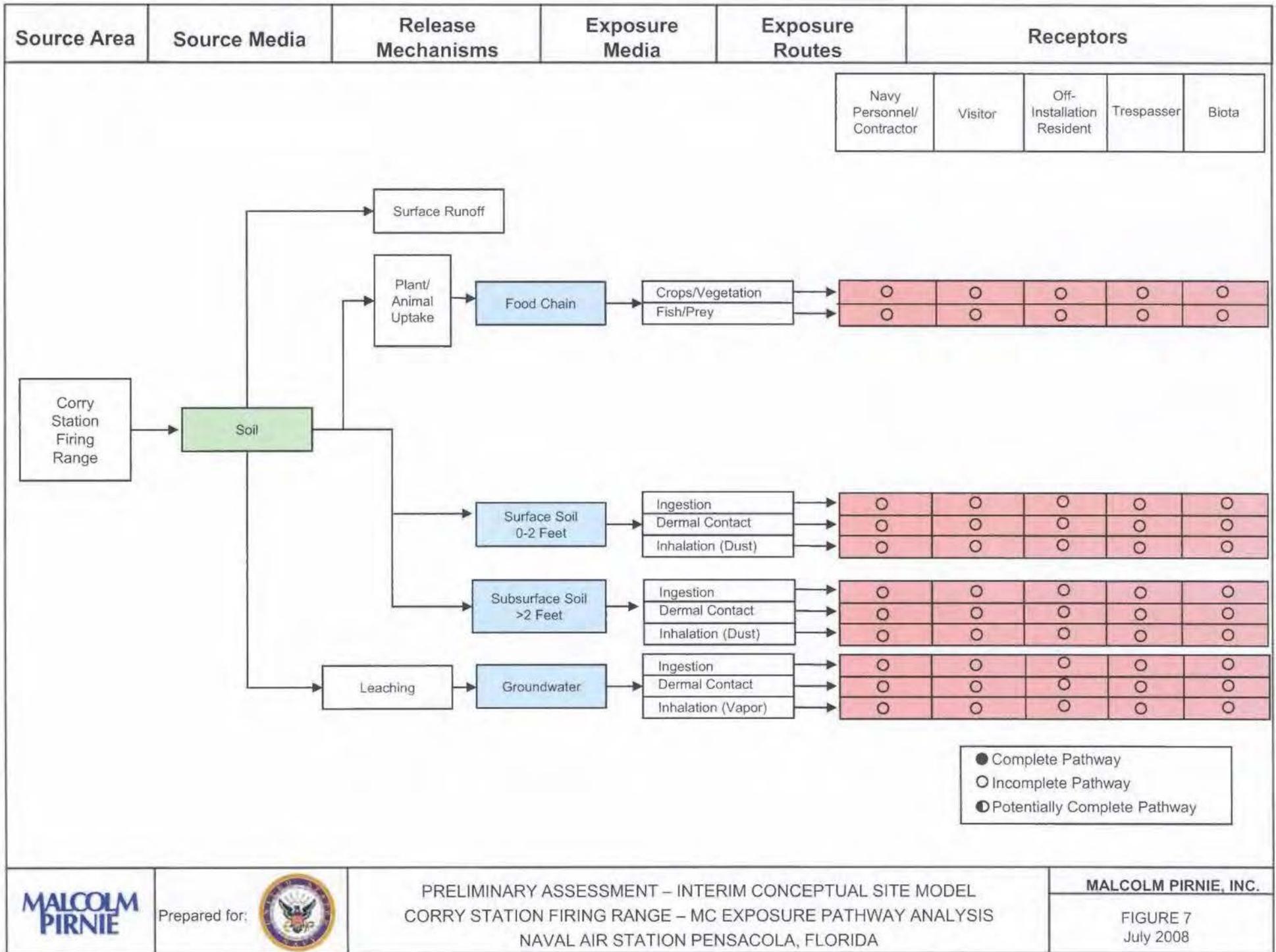
trespassers exploring the area; and biota that construct burrows or forage on the undeveloped areas of the former range. Potentially complete exposure pathways exist for these receptors via incidental ingestion, dermal contact, and inhalation.

Subsurface Soil (>2 feet): MC may be present in subsurface soil due to migration from the overlying surface soil via leaching mechanisms. Intrusive activities during the construction of the Army Reserve Center may distribute lead shot and/or clay targets into the subsurface soil. Navy personnel/contractors and trespassers may be exposed to MC in the subsurface soil during excavation associated with construction activities. In addition, biota may also be exposed to MC in subsurface soil while constructing burrows. Potentially complete exposure pathways therefore exist for these receptors via incidental ingestion, dermal contact, and inhalation of dust caused by subsurface drilling or soil excavation (including burrowing).

Groundwater: Depth to groundwater at the Corry Station Skeet Range is approximately three feet bgs. Due to the semi-confining unit within the Sand-and-Gravel Aquifer, vertical flow between the surface and the main producing zone of the aquifer, where the Corry Station production wells are located, is restricted; therefore, MC migration into the main producing zone of the Sand-and-Gravel aquifer and subsequently into the production wells at Corry Station is not likely. However, groundwater within the surficial zone of the Sand-and-Gravel Aquifer could potentially be used via private wells for consumption or irrigational purposes; therefore, groundwater exposure pathways are considered to be potentially complete for off-installation residents that are located down-gradient. In addition, due to the shallow nature of groundwater at the site and the consequent ease of exposure, groundwater exposure pathways are considered to be potentially complete for Navy personnel/contractors and trespassers during excavation activities, and for biota during burrowing.

Food Chain: MC in soil may accumulate in plants, which can subsequently be consumed by animals foraging on the former ranges. Predation of prey and/or consumption of vegetation may result in bioaccumulation of MC. Potentially complete exposure pathways therefore exist for biota that may be exposed to MC through the food chain.





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MALCOLM
PIRNIE

Munitions Characterization
Corry Station Skeet Range and Firing Range

Legend

- Installation Boundary
- Range Boundary
- Site Boundary
- Surface Danger Zone
- Historical Site Features
- Firing Line
- Clay Fragments
- MEC Presence***
- Known
- Suspect

*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.



Data Source: NAS Pensacola, GIS Data, 2007
Map of NAS Pensacola (Corry Station)
Showing Conditions on June 30, 1947
Map of Corry Field Naval Auxiliary
Showing Conditions on June 30, 1943

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
Edition: Interim Conceptual Site Model
Date: July 2008



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Preface

This interim deliverable provides the Navy with a summary of information collected to date and the data sources used to support the Conceptual Site Model (CSM). It summarizes our current understanding of the site, presented in the attached Information Profiles. It also provides draft Graphical Presentations of the site layout and CSM. The Information Profiles and the Graphical Presentations will serve as the basis of the CSM section of the Preliminary Assessment (PA) Report.

This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. The Bayou Grande bay intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center; Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

Fort Barrancas was originally constructed by the Spanish with the first construction on the site being in 1698 and named Fort San Carlos de Austria. The structures on site were destroyed, rebuilt, and renovated multiple times over the years. In 1787, the sea-level water battery was added to the fort on the southern side; today, this sea-level structure is sometimes referred to as Fort San Carlos. The brick structure now identified as Fort Barrancas was constructed on the hill-top above the sea-level structure from 1834 to 1844

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by the Spanish and replaced earlier wood and earth structures. In 1821, the fort came under U.S. rule. Fort Barrancas was held by the Confederate forces until 1862, and was occupied by a single garrison until 1890 when it was re-armed for use as a training facility. Fort Barrancas was used briefly in the Spanish-American War and then disarmed in 1900. Until 1930 it served as an observation and communications post. In 1947, following World War II, Fort Barrancas was deactivated for the last time. The property was transferred to the National Park Service (NPS) in 1971.



Figure 1: Aerial photograph of Fort Barrancas

The Fort Barrancas Rifle Ranges are located to the south and southeast of historical Fort Barrancas, within the boundaries of the main NAS Pensacola installation. The total site boundary for the Fort Barrancas Rifle Ranges, which includes Rifle Range 1, Rifle Range 2a, and Rifle Range 2b, is 1,582.12 acres. The range boundary for Rifle Range 1 is denoted by its surface danger zone (SDZ), since, based on available information, this range did not have a backstop berm to contain bullets. The range boundaries for Rifle Ranges 2a and 2b encompass the firing lines and target areas including berms, since, based on historical maps, these ranges had backstop berms that would have contained the great majority of the bullets fired. The range boundary for Fort Barrancas Rifle Range 1 encompasses approximately 1,577 acres, Rifle Range 2a encompasses approximately 5 acres, and Rifle Range 2b includes approximately 1.4 acres. Because the range boundaries overlap in some areas, the sum of the range boundaries is greater than the total site boundary. The boundaries described above are the boundaries used to develop this ICSM. Rifle Ranges 2a and 2b appear on only one historical map dated 1893. An additional firing point was also included on the 1893 map located almost due south of the berm, however, it was marked as a 'proposed' firing point on the map and has not been included. No additional archival records or references to the

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ranges were located; therefore, no information regarding munitions used or construction details are known. Direction of fire for Rifle Range 2a and 2b, as depicted on the 1893 map, was from two firing points towards a target in front of Fort San Carlos and into a backstop berm. The general direction of fire for Rifle Range 2b was from southeast to northwest, while the general direction of fire for Rifle Range 2a was from east to west. Rifle Range 1 is shown on a 1910 historical map. The map of this range shows three firing lines at 100, 200, and 300 yards. The direction of fire for Rifle Range 1 was from northeast to southwest. Orientation of the butt and targets shown on the map indicate that firing was directed over the butt at the targets; therefore, munitions used on this range would have traveled over the butt and landed within the forested dune area or the waters of Big Lagoon. All three ranges cross Radford Boulevard and partially cover the recreational fields south of Radford; Range 2a also crosses the Coast Guard facility.



Figure 2: Historical 1910 map showing firing positions Rifle Range 1

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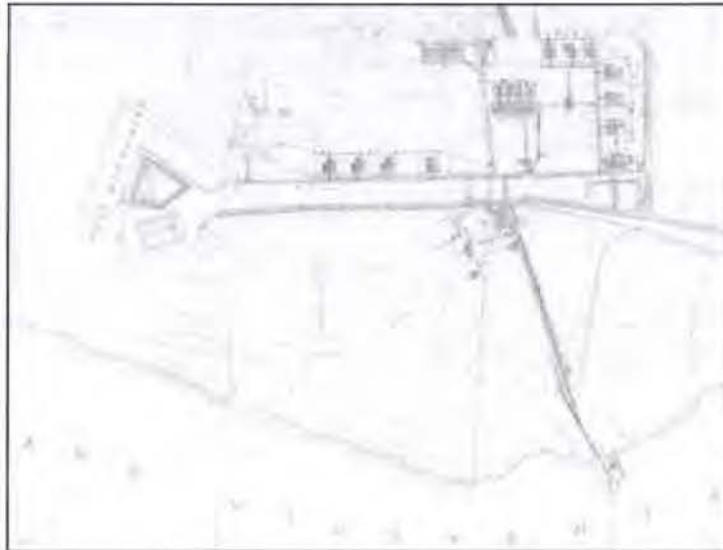


Figure 3: Historical 1893 map showing firing positions for Rifle Ranges 2a and 2b

Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
- National Museum of Naval Aviation
- Historical Map Files, Building 458

Personal Interviews:

- Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department
- Mr. Jim Kane, Deputy Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Steve Ward, Real Property Management, NAVFAC SE Public Works Department Pensacola
- Commander Kristine Nielsen, Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Bill Taylor, NAVFAC SE Public Works Department Environmental
- Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE Public Works Department Pensacola
- Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc.
- Mr. Jeff Halstead, Exhibit Specialist, Fort Pickens State Park

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- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park
- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

A visual survey of the area around the Fort Barrancas Rifle Ranges was conducted on 30 November 2007 during the site visit. Malcolm Pirnie team members Ms. Daria Navon, Ms. Susan Burnett, Ms. Angela Nolan, Ms. Cynthia Henderson, and Mr. Dan Hains were present. The purpose of the visual survey was to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), any evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site.

The location of the Fort Barrancas Rifle Ranges is just south and east of Fort Barrancas. The area north of Radford Boulevard is very level and contains scattered slash pine (*Pinus elliottii*) trees with a few live oaks (*Quercus virginiana*) a mowed turf grass understory. There are no buildings in the area north of Radford Boulevard within the range. For the area included in the ranges south of Radford Boulevard, some of the area is undeveloped scrub vegetation including sand scrub pine (*Pinus clausa*) and live oaks. The recreational fields located south of Radford Boulevard are crossed by the ranges. These areas have a few trees with a maintained lawn groundcover. Various small roads and drainage ditches are also present in this area. Range boundaries for Rifle Ranges 2a and 2b also extend over a Coast Guard Facility and into the scrub area on the east side of the Coast Guard facility. No MEC, munitions debris, or bullets/bullet fragments were observed during the visual survey.



Figure 4: View of Fort Barrancas and backstop berm for Rifle Ranges 2a and 2b

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Figure 5: View of recreational field south of Radford Boulevard

Documents and Reports:

- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Florida Natural Areas Inventory Report for Emerald Coast Utility Authority and NAS Pensacola Force Main and Lift Stations. August 2007.
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010
- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001
- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004
- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006

Websites:

- www.naspensacola.navy.mil (Installation Information)
- http://en.wikipedia.org/wiki/Fort_Barrancas (Fort Barrancas Information)

Maps:

- Map of Fort Barrancas, Florida, 1893
- Map of Fort Barrancas, Florida, 1910

Historical records found at the National Archives for the Fort Barrancas Rifle Ranges included the maps referenced above. No other records pertaining to specific use or maintenance of the range were identified.

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Due to the age of the range and redevelopment of the site, interviews with Navy personnel provided no additional information about this range.

Information Profiles

Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	Fort Barrancas Rifle Ranges
Range/Site Location	The Fort Barrancas Rifle Ranges are located east and south of Fort Barrancas within the main NAS Pensacola installation. The site lies north of Big Lagoon, west of Pensacola Bay, and north of the Gulf of Mexico.
Range/Site History	The ranges were shown on maps dated 1893 and 1910. No other information regarding the range history was reviewed or identified.
Range/Site Area and Layout	The Fort Barrancas Rifle Ranges are an approximately 1,582-acre site located east and south of Fort Barrancas along Radford Boulevard.
Range/Site Structures	One building associated with the recreational fields is located within the Fort Barrancas Rifle Ranges site boundary. Fort San Carlos and Fort Barrancas, which are on National Park Service property, lie just to the west of the ranges. No other structures exist on the site, although others are in the immediate vicinity.
Range/Site Boundaries	N: Housing S: Recreational fields, beach, and Big Lagoon W: Undeveloped areas and beach E: Undeveloped areas and beach
Range/Site Security	A security check point must be passed to gain access to NAS Pensacola. Access to the site is unrestricted from inside the installation.

Conceptual Site Model Information Profiles – Munitions/Release Profile

Information Needs	Preliminary Information
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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	Specific ordnance types used at the range were not identified; however, typical munitions used at a rifle range include .30 caliber rifle cartridges.
Maximum Probability Penetration Depth	<p>Maximum penetration depth into a berm is estimated to be 12 inches; however, no berms are left at the site. Demolition of former ranges and site structures, along with construction and grading of former range areas, may have resulted in the deposition of lead bullets and bullet fragments in the top one to two feet of soil at the site.</p> <p>Additionally, the configuration of Rifle Range1 was as a fire-over berm with targets located behind the berm. Based on that configuration, during the active life of the range bullets and bullet fragments would have been located only on the ground or in Big Lagoon; however, demolition of the former range features and natural wave action along Big Lagoon may have resulted in deposition of bullets or bullet fragments in surface soil, subsurface soil, or the sediment of Big Lagoon. At this site ammunitions could potentially occur at a variety of depths in the Big Lagoon sediments due to the dynamic nature of shorelines.</p>
MEC Density	Based on historical documentation, the Fort Barrancas Rifle Ranges were used only for small arms training. MEC are not suspected to be present at the site.
Munitions Debris	No evidence of munitions debris was identified during the visual survey.
Associated Munitions Constituents	<p>The primary MC associated with small arms ammunition is lead. Other MC may include antimony, arsenic, copper, zinc and constituents associated with black and/or smokeless powder; however, these constituents are less likely to be of concern as they are either present in only minor concentrations or are typically consumed when the small arms ammunition is fired.</p> <p>No sampling is known to have occurred in this area.</p>

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Conceptual Site Model Information Profiles – Munitions/Release Profile

Information Needs	Preliminary Information
Migration Routes/Release Mechanisms	Migration of MC from the Fort Barrancas Rifle Ranges may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake. Human activities, including maintenance such as mowing and activities like grading, can cause MC migration. Another potential migration route identified for this site would be contractor maintenance of existing underground utilities in the area and subsequent contact with surface or subsurface soil via inhalation or dermal contact. Future construction, excavation, or other site work could also serve as a migration/release mechanism.

Conceptual Site Model Information Profiles – Physical Profile

Information Needs	Preliminary Information
Climate	The climate at NAS Pensacola is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.
Topography	Fort Barrancas is located within the Gulf Coastal Lowlands which are generally characterized by poor drainage and elevations less than 40 feet above mean sea level on NAS Pensacola (INRMP, 2001). The Fort Barrancas Rifle Range area is a relatively flat area, gently sloping to the south towards Big Lagoon.

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Geology	<p>The Fort Barrancas Rifle Ranges are located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface (bgs), and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).</p> <p>No site specific geology information is known for this site.</p>
Soil	<p>Based on the U.S. Department of Agriculture Soil Survey for Escambia County, soils within the vicinity of these ranges include the Corolla, Kureb, and Newhan soil series of the coastal lowlands. These soils are generally sandy and are poorly- to well-drained (USDA, 2004).</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWWMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWWMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridian Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWWMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for NAS Pensacola is a well field located at Naval Technical Training Center (NTTC) Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>Depth to groundwater at the Fort Barrancas Rifle Ranges is not known. In addition, sampling is not known to have occurred in the vicinity of this site.</p>
Hydrology	<p>A portion of Big Lagoon is included within Rifle Range 1 and Rifle Range 2a and 2b are just north of Big Lagoon which flows into Pensacola Bay to the east. A portion of the site lies within the 100-year floodplain that occurs along the beach (INRMP, 2001).</p> <p>Several drainage ditches are located within the range areas but are not near target or impact areas.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Vegetation	Most of the vegetation in the area consists of an overstory of slash pine trees with some live oaks and a mowed turf grass understory. The scrub area near Big Lagoon included a mix of sand pine and live oaks.

Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	Current land use of the Fort Barrancas Rifle Ranges includes recreational fields, undeveloped areas, and Coast Guard facilities.
Current Human Receptors	Current human receptors include Navy and Coast Guard personnel, contractors, visitors, and recreational users. Visitors may include people who are touring the adjacent Fort Barrancas historical site.
Current Activities (frequency, nature of activity)	Current activities include use of recreational fields and beach by base personnel, visitors, or recreational users, and maintenance of buildings, grounds, and underground utilities.
Potential Future Land Use	No change in land use is planned.
Potential Future Human Receptors	Potential future human receptors consist of the current receptors, as no change in land use is planned.
Potential Future Land Use Related Activities	No change in land use is planned.
Zoning/Land Use Restrictions	There are no known zoning/land use restrictions at the Fort Barrancas Rifle Ranges although this area is adjacent to National Park Service property.
Beneficial Resources	Wetlands are located along drainage ditches. Additionally, according to a 2007 Florida Natural Areas Inventory (FNAI) report, the state listed threatened plant Godfrey's Goldenaster (<i>Chrysopsis godfreyi</i>) may occur on the site. There are no other known beneficial resources located at the Sherman Field Rifle Range. There are no other known beneficial resources located at the Fort Barrancas Rifle Ranges.
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (U.S. Census, 2000). Approximately 14,720 civilian and military personnel are employed at NAS Pensacola (INRMP, 2001).

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Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	Habitat at the Fort Barrancas Rifle Ranges includes maintained areas with a slash pine overstory and some live oaks and a mowed turf grass understory as well as the maintained turf grass of the recreational fields. Scrub areas are located near the beach and include a mix of sand scrub and live oaks. Some of the aquatic habitat of Big Lagoon is also included in the site area.
Degree of Disturbance	The current and future land uses of the Fort Barrancas Rifle Ranges result in a moderate degree of disturbance to the habitat and ecological receptors.
Ecological Receptors	Terrestrial ecological receptors may include mammals (e.g., foxes, bears, and squirrels), reptiles (e.g., tortoises), terrestrial plants, and a variety of bird species. Raptors such as osprey (<i>Pandion haliaetus</i>) are known to occur on the installation. Aquatic ecological receptors in nearby surface water may include various species of fish, amphibians, and aquatic/wetland vegetation. The state listed threatened plant Godfrey's Goldenaster (<i>Chrysopsis godfreyi</i>) may occur on the site (FNAI, 2007). No other threatened or endangered species are known to occur on or near the range.
Relationship of MEC/MC Sources to Habitat and Potential Receptors	Flora may assimilate MC in surface and/or subsurface soil, via plant uptake. Fauna may be exposed to MC in surface soil or sediment through ingestion, dermal contact, and inhalation or by ingesting vegetation or prey organisms that may bioaccumulate MC.

Graphical Presentations

The attached Munitions Characterization Map and Exposure Pathway Analysis Figure provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Historical and visual evidence indicate that MEC are not present at the site; therefore, there are no complete exposure pathways for MEC. As such, an Exposure Pathway Analysis Figure for MEC was not created. However, information obtained and visual observations indicate that the potential for MC exists.

The Exposure Pathway Analysis figure provides a summary of complete, potentially complete, and incomplete exposure pathways for MC. For MC, interaction between the source (e.g., the berm) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to

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groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

MC Exposure and Pathway Analysis

The pathway analysis for MC is shown in Figures 6, 7, and 8 for Rifle Ranges 1, 2a, and 2b, respectively. Potential receptors include both human (Navy or Coast Guard personnel, contractors, and visitors/recreational users) and ecological (biota) receptors that may come in contact with MC in the source medium or other potentially contaminated media from the site. While the Fort Barrancas historical site is a separate piece of property owned by the National Park Service, there is only a partial fence between Fort Barrancas and the sites described in this ICSM, therefore, a visitor could easily move from National Park Service property to the adjacent ranges. Pathways are shown for each exposure medium and are discussed below.

MC exposure and pathway analysis is different for the ranges described here due to the habitats included within the range boundaries. Since Rifle Range 1 was a range where the firing was directed over the berm instead of into a berm, the range boundary encompasses a large area of Big Lagoon as well as an area adjacent to the shore. Rifle Range 2a and 2b fired from points located near the shore back towards a berm located in front of Fort San Carlos; consequently, their impact area is completely on land.

Surface Water/Sediment: Surface water and sediment issues are different for the rifle ranges being discussed. For Rifle Range 1, MC may migrate from soil to surface water/sediment through surface water runoff or through deposition of projectiles during firing exercises directly into Big Lagoon. Aquatic and terrestrial biota that forage in the sediment and/or ingest surface water in Big Lagoon represent potential receptors; MC may also bioaccumulate and biota may be exposed to MC through the food chain. Potentially complete exposure pathways also exist for visitors/recreational users via incidental ingestion and dermal contact while utilizing the beaches or ball fields. Navy or Coast Guard personnel and contractors are unlikely to ingest or contact surface water or sediment so pathways for those receptors are incomplete.

For Rifle Range 2a and 2b, the backstop berm, was located near Fort San Marcos (just below Fort Barrancas). This area would include most of the potential impacts from MC; however, there are no surface water features noted within this area. Therefore, surface water/sediment exposure pathways are incomplete for all receptors.

Surface Soil (0-2 feet): Surface soil issues for all ranges are similar. MC may be present in surface soil from the bullets that were fired around and into targets for all three rifle ranges and in the area behind the targets for Rifle Range 1. The mechanism for exposure for Navy and Coast Guard personnel would be mowing or maintenance of facilities and grounds. For contractors, the potential mechanism for exposure would likely be the maintenance of underground utilities in the area for Rifle Range 2a and 2b; there are no utilities near the target area for Rifle Range 1. Since a portion of the area is beach and ball fields, visitors/recreational users could come into contact with surface soil while present on the sites. Aquatic and terrestrial biota that forage or burrow in the soil also represent potential receptors. MC may also

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bioaccumulate and biota may be exposed to MC through the food chain. Potentially complete exposure pathways exist for all receptors via ingestion, inhalation, and dermal contact.

Subsurface Soil (>2 feet): MC may be present in subsurface soil at all of the ranges due to migration from the overlying surface soil via leaching mechanisms or due to disturbance from construction activities, although potential receptors differ for the sites. For Rifle Range 1, the target area and area where most of the MC would be found is located in a fairly undisturbed area south of Radford Boulevard and the remaining site boundary extends over the undeveloped beach area and Big Lagoon. The undeveloped nature of the area and lack of utilities would preclude disturbance by contractors and Navy or Coast Guard personnel in normal circumstances; no complete pathways exist for them. Potentially complete exposure pathways exist for biota via incidental ingestion, dermal contact, and inhalation of dust caused by subsurface excavation (including burrowing). The erosive beach areas within the site boundary of Rifle Range 1 also result in potentially complete pathways for visitors/recreational users either from Fort Barrancas or utilizing the beach, who could come into contact with MC in the subsurface soil that had been exposed through erosion.

For Rifle Range 2a, contractors could potentially be exposed to MC in the subsurface during maintenance of underground utilities in the area resulting in potentially complete exposure pathways via ingestion, inhalation or dermal contact. Navy or Coast Guard personnel are unlikely to be engaged in activities that would result in contact with subsurface soil so pathways for those receptors are incomplete. Rifle Range 2a does include a beach area that could result in potentially complete pathways for visitors/recreational users utilizing the beach which could come into contact with MC in the subsurface soil that had been exposed through erosion. Potentially complete exposure pathways exist for biota via incidental ingestion, dermal contact, and inhalation of dust caused by subsurface excavation (including burrowing).

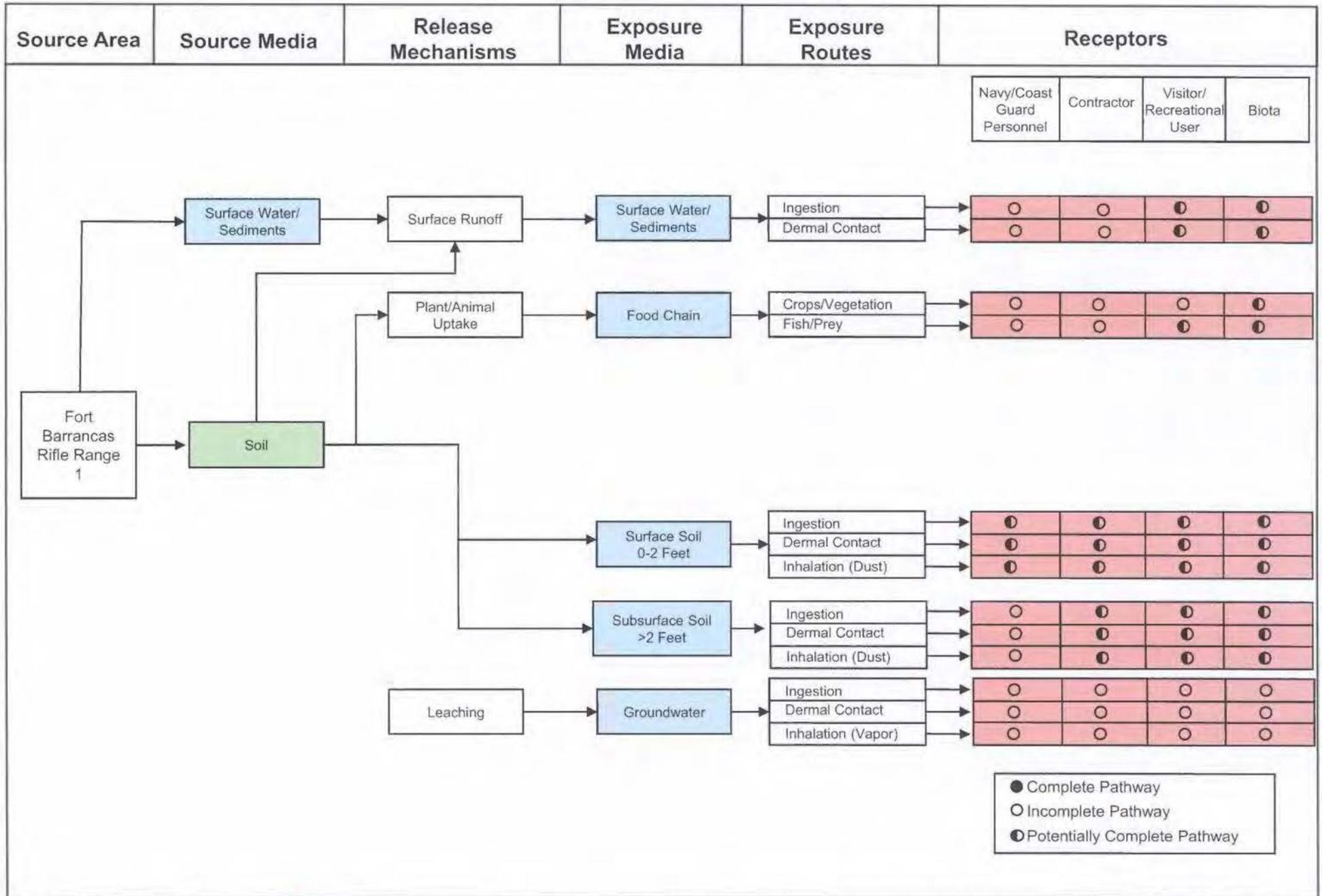
For Rifle Range 2b, contractors could potentially be exposed to MC in the subsurface during maintenance of underground utilities in the area resulting in potentially complete exposure pathways via ingestion, inhalation or dermal contact. Potentially complete exposure pathways also exist for biota via incidental ingestion, dermal contact, and inhalation of dust caused by subsurface excavation such as burrowing. Navy or Coast Guard personnel are unlikely to be engaged in activities that would result in contact with subsurface soil so pathways for those receptors are incomplete. Rifle Range 2b does not contain any of the beach area or the ball field area; therefore, the exposure pathway for visitors/recreational users to MC in the subsurface is incomplete. Potentially complete exposure pathways exist for biota via incidental ingestion, dermal contact, and inhalation of dust caused by subsurface excavation (including burrowing).

Groundwater: The depth to groundwater at the Fort Barrancas Rifle Ranges is unknown. Since the main source of potable water for NAS Pensacola is a well field located at NTTC Corry Station, which is located to the north of Bayou Grande, water from the site would not be used for drinking water. Since groundwater is not used as a water source in this area, groundwater exposure pathways are considered to be incomplete for all receptors.

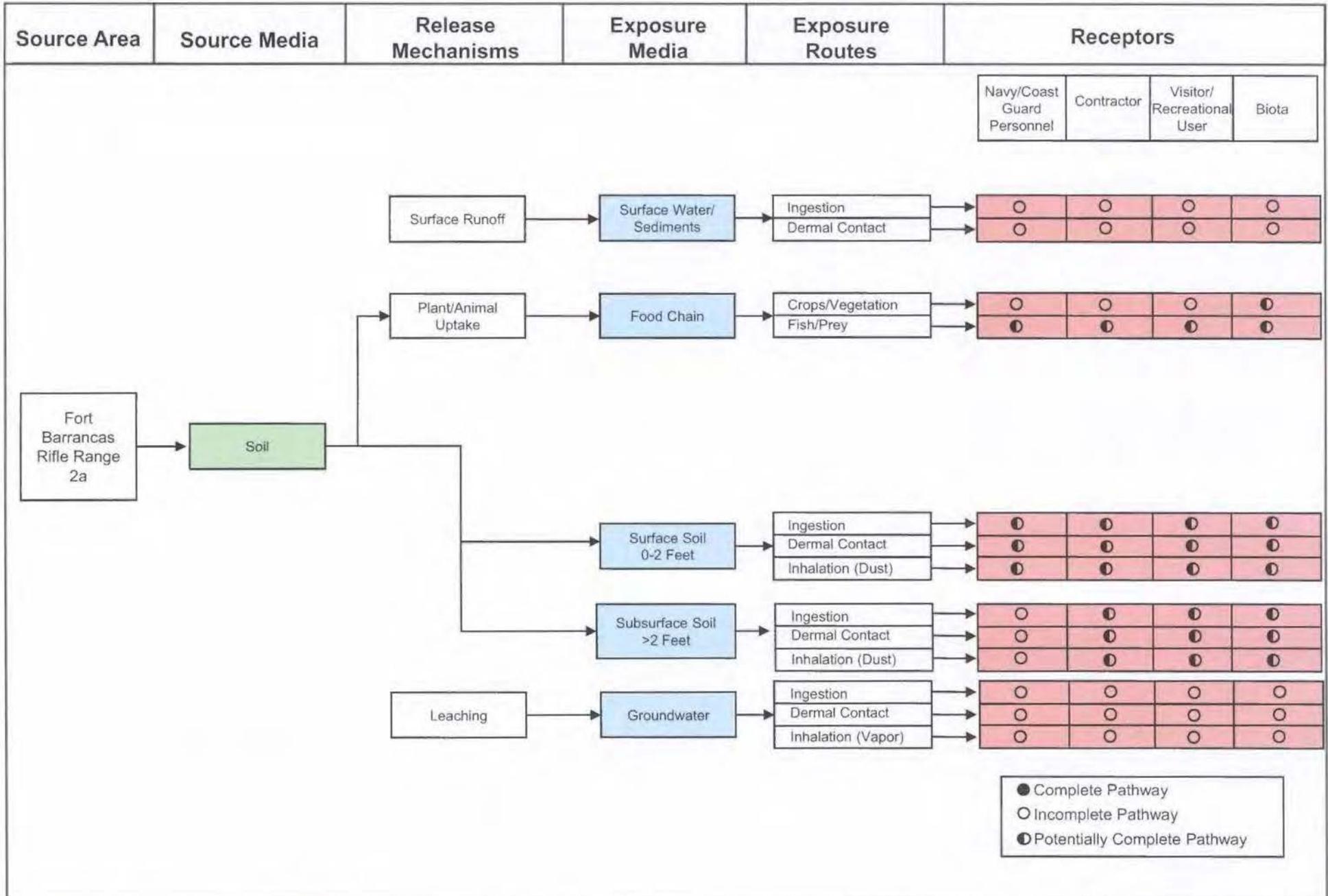
Food Chain: MC in soil may bioaccumulate in plants or animals and then be consumed by animals foraging on the range. Raptors such as osprey (*Pandion haliaetus*) are known to occur on the installation. Predation of prey and/or consumption of vegetation on the range may result in bioaccumulation of MC. MC

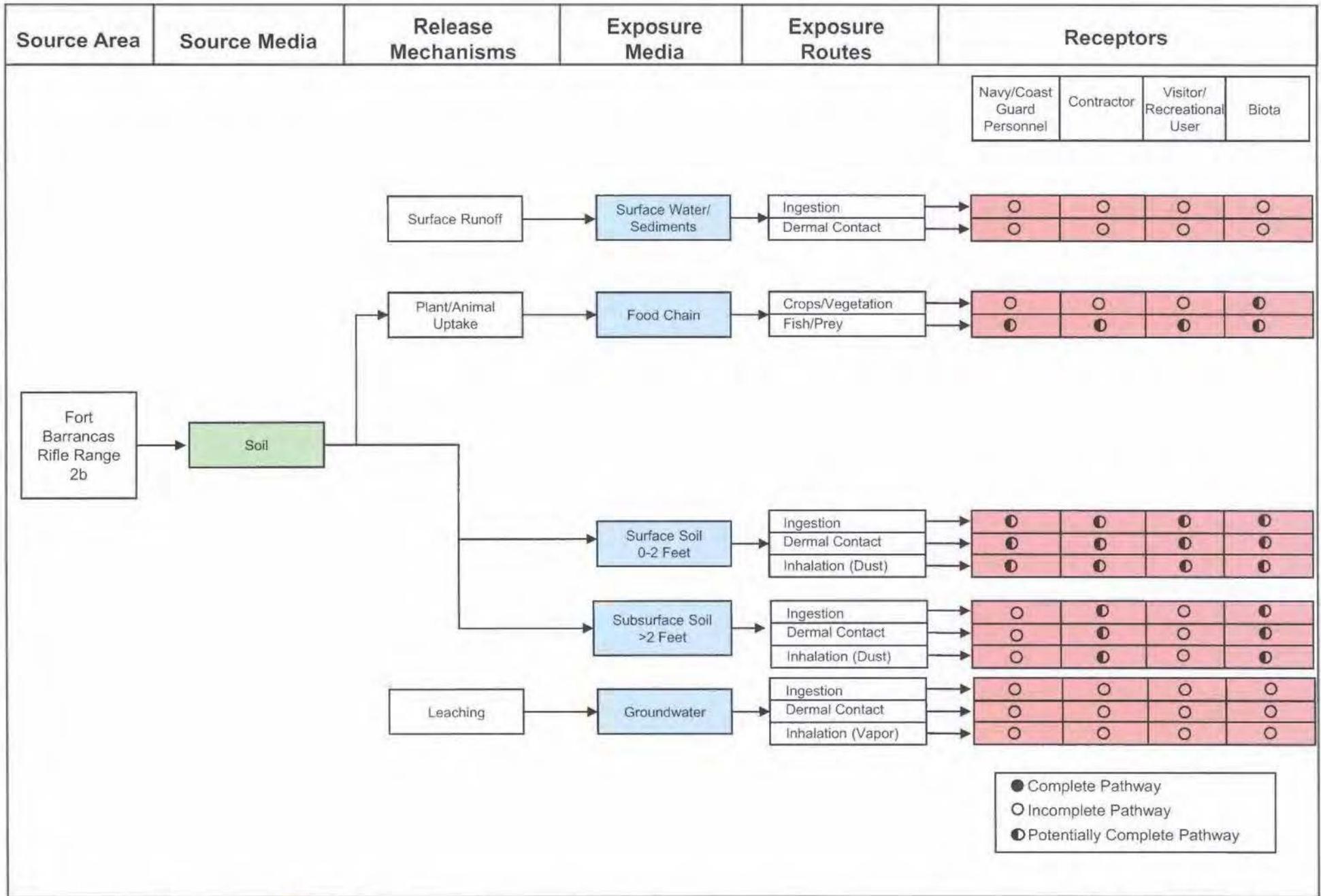
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in surface water/sediment may also bioaccumulate in plants and animals in the Big Lagoon (for Rifle Range 1). Potentially complete exposure pathways are identified for biota who may be exposed to MC through the food chain and for visitors/recreational users utilizing the beach who may fish in Big Lagoon and other nearby water bodies.



● Complete Pathway
 ○ Incomplete Pathway
 ● Potentially Complete Pathway





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MALCOLM
PIRNIE

Munitions Characterization
Fort Barrancas Rifle Ranges

Legend

- Installation Boundary
- Range Boundary
- Site Boundary
- Firing Line
- Historical Site Features
- Target Area
- Surface Danger Zone
- National Park Service Boundaries
- Berm
- Firing Points

MEC Presence*

- Known
- Suspect

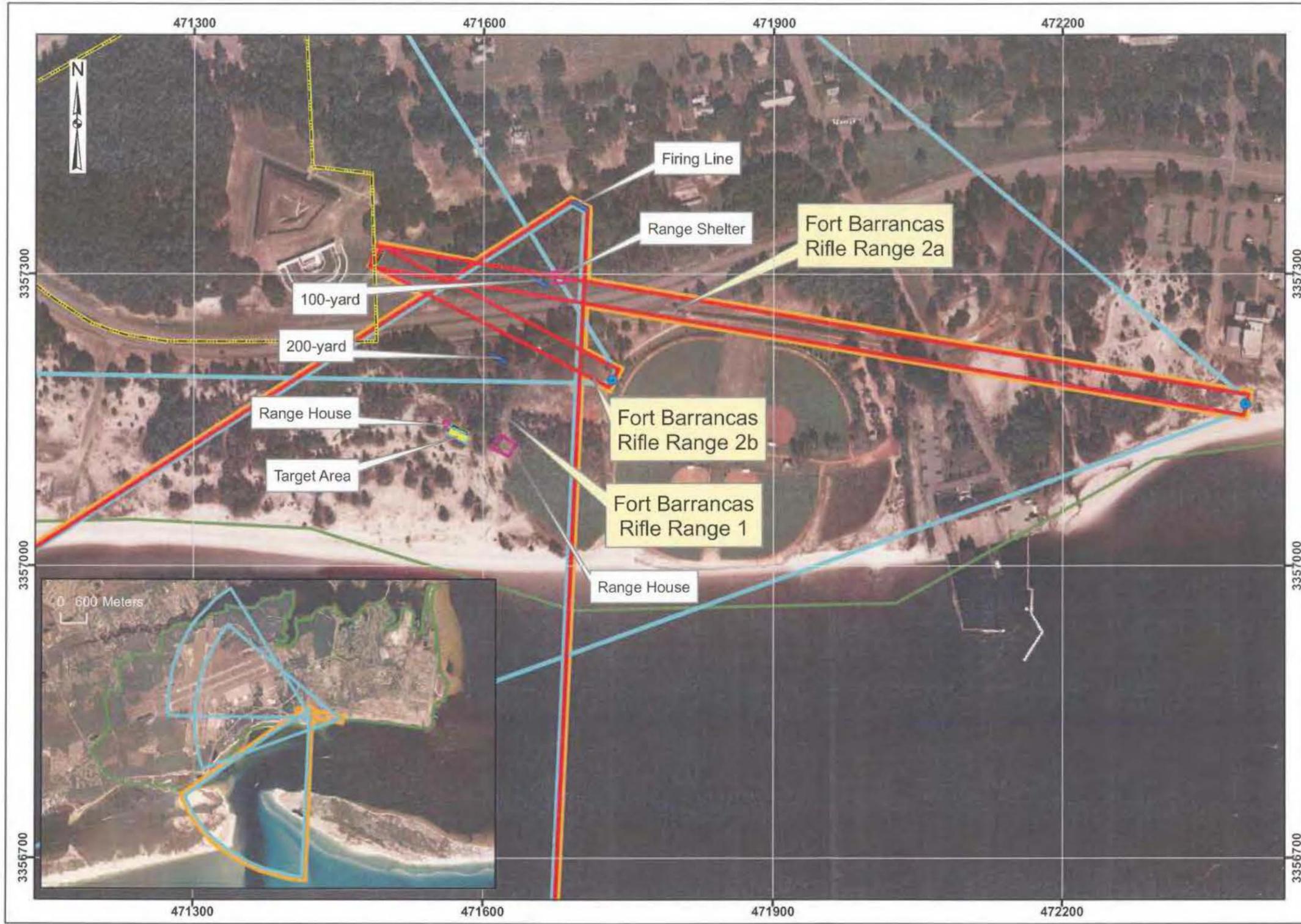
*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.



Data Source: NAS Pensacola, GIS Data, 2007
Fort Barrancas, Florida, 1910
Fort Barrancas, Florida, 1893
Real Estate Summary Map, Naval Air Station Pensacola, 2002

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
Edition: Interim Conceptual Site Model
Date: July 2008



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National Cemetery Gunnery Area South
Naval Air Station Pensacola, Florida**

Preface

This interim deliverable provides the Navy with a summary of information collected to date and the data sources used to support the Conceptual Site Model (CSM). It summarizes our current understanding of the site, presented in the attached Information Profiles. It also provides draft Graphical Presentations of the site layout and CSM. The Information Profiles and the Graphical Presentations will serve as the basis of the CSM section of the Preliminary Assessment (PA) Report.

This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. The Bayou Grande bay intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center; Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

The National Cemetery Gunnery Area South covers approximately 2.9 acres in the central portion of NAS Pensacola. The majority of the Gunnery Area South is located west of Barrancas National Cemetery, on the north side of Hovey Road.

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Figure 1: Aerial photograph of Barrancas National Cemetery

The site is comprised of the Gunnery Area South Machine Gun Range and the Gunnery Area South Pistol Range. The Gunnery Area South Machine Gun Range covers approximately 2.4 acres and is located on the north side of Hovey Road. It is shown on historical maps dated 1933 and 1939 through 1943. The Gunnery Area South Pistol Range is located just west of the South Machine Gun Range and covers approximately 0.5 acres. This range is illustrated on historical maps dated 1940 through 1943.

A 1941 map shows the details of both ranges in the Gunnery Area South. Firing lines for both ranges were set along what is currently Hovey Road. The Gunnery Area South Pistol Range had a 50-meter firing line, and the Gunnery Area South Machine Gun Range had 50-meter and 25-meter firing lines. One continuous berm, approximately 200 meters long and 20 meters wide, was located north of the firing lines. The following structures for the Gunnery Area South were listed on a 1943 map: Gun Stand, Range Estimation Range, Storehouse, Armory, Belting and Cleaning House, and Repair House.

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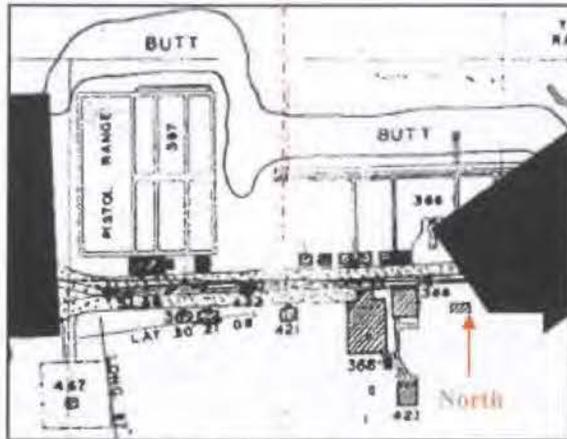


Figure 2: Gunnery Area South, 1941 historical map

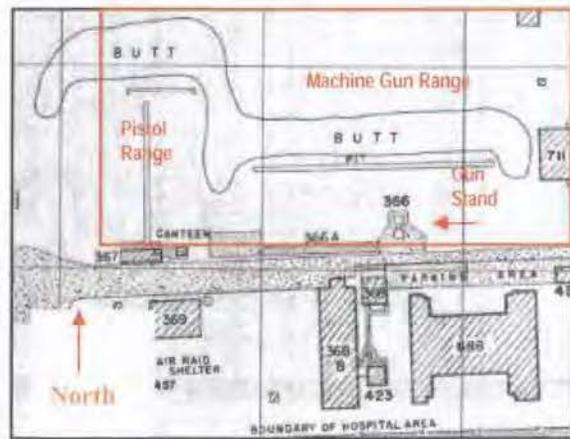


Figure 3: Gunnery Area South, 1943 historical map

The National Cemetery Skeet Range and Trap Ranges are respectively located north and east of the Gunnery Area South. The surface danger zone (SDZ) for the National Cemetery Skeet Range overlaps the northeast corner of the Gunnery Area South Machine Gun Range. As such, MC and/or munitions debris associated with the usage of the National Cemetery Skeet Range may be present at the Gunnery Area South. No additional information regarding munitions use associated with this range was obtained during the archival data search.

No Installation Restoration (IR) Sites are located within the Gunnery Area South; however, two IR Sites are located north of the area just south of Barrancas National Cemetery. IR Site 8 (Rifle Range Disposal Area) and IR Site 24 (dichloro-diphenyl-trichloroethane [DDT] Mixing Area) are located approximately 350 feet north of the Gunnery Area South. The two sites are collectively referred to as Operable Unit (OU) 13. Field investigations of OU 13 were conducted from 1995 to 1997, and soil and groundwater samples were collected and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), target analyte list (TAL) metals, cyanide, pesticides, and polychlorinated biphenyls (PCBs). The concentrations of polyaromatic hydrocarbons (PAHs) and lead did not exceed Preliminary Remediation Goals (PRGs) or NAS Pensacola reference concentrations. Cadmium and dieldrin were present in elevated levels in both soil and groundwater at these sites. Consequently, soil contaminated with these analytes was excavated from the sites in 2004. The Record of Decision for contaminated groundwater included the implementation of a groundwater monitoring plan to monitor expected contaminant reductions, as well as the implementation of land-use controls that restricted the use of the surficial aquifer until cleanup levels were achieved.

Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

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Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
- National Museum of Naval Aviation
- Historical Map Files, Building 458

Personal Interviews:

- Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department
- Mr. Jim Kane, Deputy Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Steve Ward, Real Property Management, NAVFAC SE Public Works Department Pensacola
- Commander Kristine Nielsen, Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Bill Taylor, NAVFAC SE Public Works Department Environmental
- Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE Public Works Department Pensacola
- Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc.
- Mr. Jeff Halstead, Exhibit Specialist, Fort Pickens State Park
- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park
- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

A visual survey of the National Cemetery Gunnery Area South was conducted on 30 November 2007 during the site visit. Malcolm Pirnie team members Ms. Susan Burnett, Ms. Angela Nolan, and Mr. Dan Hains were present. The purpose of the visual survey was to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), any evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site.

The visual survey consisted of walking the range vicinity to determine the presence/absence of MEC and MC within and along the periphery of the site. The Gunnery Area South site is currently located on the north side of Hovey Road in a developed area. Building 488 (Naval Operational Medical Institute [NOMI] Headquarters) and the associated asphalt parking lot are currently located in the southern portion of the Gunnery Area South Machine Gun Range. Building 461 (Printing Plant) has been constructed over the former Gunnery Area South Pistol Range. No evidence of range structures or historical range activities was observed within the boundaries of the Gunnery Area South Pistol Range. Munitions debris observed in the Gunnery Area South Machine Gun Range included multiple copper casings of expended lead .30-caliber ammunition that were observed near Building 488 in the volleyball court, in the sandy areas on the eastern edge of the parking lot, and along the north face of the building. Multiple areas with high densities of clay fragments were also observed in an open lot and in the sand volleyball court north of Building 488. The clay fragments verify the usage of the National Cemetery Skeet Range that was historically located

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north of the Gunnery Area South Machine Gun Range. No MEC were observed at the Gunnery Area South site.



Figure 4: Clay target fragments, Gunnery Area South Machine Gun Range



Figure 5: Munitions debris, Gunnery Area South Machine Gun Range

Documents and Reports:

- Final Initial Assessment Study of Naval Air Station Pensacola, Florida, June 1983
- Naval Air Station Master Plan, Naval Complex Pensacola, May 1989
- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994

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- Remedial Investigation Report Addendum, Operable Unit 13 - Sites 8 and 24, NAS Pensacola, Florida, September 1999
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010
- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001
- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004
- Final Integrated Cultural Resources Management Plan, NAS Pensacola, Escambia County, Volume 1, February 2004
- Interim Removal Action Report, Excavation of Contaminated Soil at Operable Unit 13 - Site 8, NAS Pensacola, Florida, October 2004
- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006
- Record of Decision for Operable Unit 13 (Sites 8 and 24), NAS Pensacola, Florida, September 2006

Websites:

- www.naspensacola.navy.mil (Installation Information)
- www.pensacolaneewcomersguide.com/military.shtml (Installation Information)

Maps:

- Map of Naval Reservation Pensacola, Florida, Showing Conditions on 30 June 1933
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on 30 June 1939
- NAS Pensacola, Florida, Map of Fire Districts, 30 June 1940
- Map of Hospital and Vicinity, NAS Pensacola, Florida, Showing Conditions on 30 June 1941
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on 30 June 1942
- Map of Hospital and Vicinity, NAS Pensacola, Florida, Showing Conditions on 30 June 1943
- [Illegible Title] Map of Pistol Range, NAS Pensacola, Florida, 1944
- Naval Air Training Bases, Pensacola, Gunnery Range, Location Plan of Proposed Utilities, 1944
- Map of Main Station Gunnery Range Extension of Water Main to Machine Gun Butt, 1944
- Map of Hospital and Vicinity, NAS Pensacola, Florida, Showing Conditions on 30 June 1947
- Naval Air Training Bases, NAS Pensacola, Gunnery Range, Outdoor Pistol Range Plan and Details, 1949
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on 30 June 1950
- NAS Pensacola, Painting of Ten Buildings, Location Plan, 1 June 1954

The historical records found at the National Archives provided information regarding the National Cemetery Gunnery Area South. Two ranges within the Gunnery Area South were shown on various historical maps dated 1933 through 1949. In addition, the interviews with Navy personnel provided valuable information about the ranges.

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Information Profiles

Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	National Cemetery Gunnery Area South
Range/Site Location	The National Cemetery Gunnery Area South is located on the western portion of Barrancas National Cemetery at NAS Pensacola in Escambia County, Florida. It lies east of Perdido Bay, west of Pensacola Bay, and north of the Gulf of Mexico.
Range/Site History	The Gunnery Area South Machine Gun Range is depicted on maps dated 1933 and 1939 through 1943. The Gunnery Area South Pistol Range is depicted on maps dated 1940 through 1943. No other information regarding the history of the Gunnery Area South was identified.
Range/Site Area and Layout	Two ranges were identified in the Gunnery Area South, which is an approximately 2.9-acre site located in the western portion of Barrancas National Cemetery at NAS Pensacola. The 2.4-acre Gunnery Area South Machine Gun Range and 0.5-acre Gunnery Area South Pistol Range are located on the north side of Hovey Road just west of the southern boundary of Barrancas National Cemetery. The SDZ associated with the National Cemetery Skeet Range overlaps the northeastern corner of the Gunnery Area South Machine Gun Range.
Range/Site Structures	Building 488 and the associated parking lot are located within the site boundary for the Gunnery Area South Machine Gun Range. Building 461 and the associated parking lot are located within the site boundary for the Gunnery Area South Pistol Range. The berm associated with the Gunnery Area South is no longer present, and no range structures or evidence of former range structures exists in the Gunnery Area South or in the immediate vicinity.

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Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Range/Site Boundaries	N: Barrancas National Cemetery; Taylor Road S: Hovey Road; paved and developed areas W: Paved and developed areas; John Tower Road E: Barrancas National Cemetery; Duncan Road
Range/Site Security	A security check point must be passed to gain access to NAS Pensacola. Access to the Gunnery Area South is not restricted from within the installation.
Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	Documentation of specific ordnance types used at the ranges was not available; however, typical munitions used for pistol ranges included .22-caliber and .45-caliber ammunition. Munitions usage at the Gunnery Area South Machine Gun Range likely included .30-caliber, .50-caliber, and 20-millimeter ammunition. Because shofall within the National Cemetery Skeet Range SDZ could have landed within the Gunnery Area South Machine Gun Range boundaries, expected munitions used at the National Cemetery Skeet Range are included as potential ammunition associated with the Gunnery Area South Machine Gun Range. These include 12-gauge, 16-gauge, 20-gauge, and .410-caliber shotgun ammunition. Munitions debris observed at the Gunnery Area South Machine Gun Range included multiple copper casings of expended lead .30-caliber ammunition.
Maximum Probability Penetration Depth	The maximum penetration depth into the backstop berm is estimated at 12 inches. Demolition of the range and site structures and construction and grading of former range areas may have resulted in deposition of lead bullets and bullet fragments in the top one to two feet of soil at the site.
MEC Density	Based on historical documentation, the Gunnery Area South was used for small arms training only. MEC or non-hazardous munitions related scrap are not known or suspected to have been present at the site.

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Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Munitions Debris	<p>Munitions debris was concentrated in the Gunnery Area South Machine Gun Range. Multiple expended lead .30-caliber bullets with copper casings were scattered along the north face of Building 488, on the eastern edge of the associated parking lot, and in the sand volleyball court north of the building. High densities of clay target fragments were also observed in the volleyball court and in the undeveloped lot north of Building 488. The fragments are likely associated with the National Cemetery Skeet Range SDZ, which overlaps the northern portion of the Gunnery Area South Machine Gun Range.</p>
Associated Munitions Constituents	<p>The primary MC associated with small arms ammunition is lead. Other MC may include antimony, arsenic, copper, zinc and constituents associated with black and/or smokeless powder; however, these constituents are less likely to be of concern as they are either present in only minor concentrations or are typically consumed when the small arms ammunition is fired.</p> <p>Clay pigeons were used as targets at the National Cemetery Skeet Range and Trap Range. Clay pigeons are typically bound together with petroleum products that contain polycyclic aromatic hydrocarbons (PAHs). Although PAHs are an associated MC, they tend to be tightly bound in the petroleum pitch and limestone matrix of the target and are therefore not readily available to the environment.</p> <p>Soil and groundwater sampling was conducted in the northwest portion of the Gunnery Area South for IR Site 8 and IR Site 24. The samples were analyzed for VOCs, SVOCs, TAL metals, cyanide, pesticides, and PCBs. The concentrations of PAHs and lead did not exceed Preliminary Remediation Goals (PRGs) or NAS Pensacola reference concentrations. Elevated levels of cyanide and dieldrin were found in both soil and groundwater at the sites, resulting in soil removal and the implementation of a groundwater monitoring system and land use controls regarding surficial aquifer use.</p>
Migration Routes/Release Mechanisms	<p>Migration of MC from the Gunnery Area South may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake. Human activities, including maintenance (e.g. mowing) and grading, can cause MC migration. Future construction, excavation, or other site work could also serve as a migration/release mechanism.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Climate	<p>The climate at NAS Pensacola is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.</p>
Topography	<p>The Gunnery Area South lies in a portion of NAS Pensacola that is approximately 20 feet to 30 feet above mean sea level. The topography at the installation is gently sloping; however, the Gunnery Area South is located in a paved and developed area which has likely been graded to create the relatively flat surface in the vicinity of the area.</p>
Geology	<p>The Gunnery Area South is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface (bgs), and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).</p>
Soil	<p>According to the Soil Survey for Escambia County, soils at the Gunnery Area South are classified as Lakeland Sand, which are very deep, excessively drained, sandy soils with rapid permeability that are typically found on moderately-sloping broad ridges (USDA, 2004).</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for NAS Pensacola is a well field located at Naval Technical Training Center Corry Station (NTTC), which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>Groundwater sampling at OU 13 indicates a north-northeast shallow groundwater flow in the vicinity of OU 13. Soil saturation occurred seven feet to nine feet bgs for the majority of the samples collected, and depths to groundwater were 5.5 feet to nine feet bgs (Remedial Investigation Report Addendum OU 13, September 1999). Groundwater at OU 13 is currently observed by a groundwater monitoring system based on the 2006 Record of Decision for the IR Sites.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrology	<p>NAS Pensacola is bordered to the south by Big Lagoon, to the east and south by Pensacola Bay, and to the north by Bayou Grande. Drainage systems and storm drains feed into short intermittent streams which empty into the bays and bayou.</p> <p>No surface water features are located within the Gunnery Area South site boundary. Surface water runoff from the site drains into the storm water collection system for the area. Drainage for OU 13 is suspected to discharge into a wetland near the golf course, which is located 800 feet north of the down-gradient boundary of OU 13.</p>
Vegetation	<p>The majority of the Gunnery Area South is developed, and the associated vegetation includes small shrubs, oak trees, and manicured lawns associated with landscaped areas. A small, wooded area is located northwest of Building 488.</p>

Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	<p>The Gunnery Area South is located in the developed portion of NAS Pensacola. The site contains administration and office buildings, asphalt parking lots, and storage areas.</p>
Current Human Receptors	<p>Current human receptors include Navy personnel, contractors, trespassers, and visitors. Navy personnel and contractors may access the site to perform environmental or ecological studies or maintenance activities. Human receptors also include site visitors on this portion of the installation.</p>
Current Activities (frequency, nature of activity)	<p>Current activities include infrequent environmental/ecological investigations and regular maintenance activities by Navy personnel and/or contractors, and general visitation by site visitors.</p>
Potential Future Land Use	<p>The potential future land use remains the same as the current land use, as no change in land use is planned.</p>
Potential Future Human Receptors	<p>Potential future human receptors remain the same as the current receptors, as no change in land use is planned.</p>
Potential Future Land Use Related Activities	<p>Potential future land use related activities remain the same as current land use related activities, as no change in land use is planned.</p>

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Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Zoning/Land Use Restrictions	Barrancas National Cemetery is located within a Historic District, and expansions, renovations, or sitings of facilities within the district are governed by guidelines and procedures of the National Historic Preservation Act. As part of the 2006 Record of Decision for OU 13, use of the surficial zone of the Sand-and-Gravel Aquifer is restricted until cleanup levels for cadmium and dieldrin are achieved.
Beneficial Resources	No beneficial resources have been identified at the National Cemetery Gunnery Area South site.
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (2000 Census). NAS Pensacola employees over 20,000 personnel and students.

Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	The Gunnery Area South is located in a completely developed area at NAS Pensacola and provides little suitable habitat for wildlife. Wildlife in the area may be limited to birds and small mammals such as squirrels that are tolerant of urban development.
Degree of Disturbance	The current and future land uses of the Gunnery Area South result in a high degree of disturbance to the habitat or ecological receptors.
Ecological Receptors	Terrestrial ecological receptors may include mammals (e.g., squirrels), terrestrial plants, and a variety of bird species. Currently, there are no known threatened or endangered species in the Gunnery Area South.
Relationship of MEC/MC Sources to Habitat and Potential Receptors	Flora may bioaccumulate MC in surface and/or subsurface soil, via plant uptake. Fauna may be exposed to MC in surface soil through ingestion, dermal contact, and inhalation, or by ingesting vegetation or prey organisms that may bioaccumulate MC.

Graphical Presentations

The attached Munitions Characterization Map and Exposure Pathway Analysis Figure provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure

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Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Historical and visual evidence indicate that MEC are not present at the site; therefore, there are no complete exposure pathways for MEC. As such, an Exposure Pathway Analysis Figure for MEC was not created. However, information obtained and visual observations indicate that the potential for MC exists.

The Exposure Pathway Analysis figure provides a summary of complete, potentially complete, and incomplete exposure pathways for MC. For MC, interaction between the source (e.g., MC in surface soil) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

MC Exposure and Pathway Analysis

The pathway analysis for MC is shown in Figure 6. Potential receptors include both human (Navy personnel, contractor, trespasser/visitor) and ecological (biota) receptors that may come in contact with MC in the source medium or other potentially contaminated media from the site. Pathways are shown for each exposure medium and are discussed below.

Surface Water/Sediment: MC may migrate from soil to surface water/sediment through surface water runoff. No surface water bodies are located in the Gunnery Area South; therefore, exposure pathways are considered incomplete for all receptors.

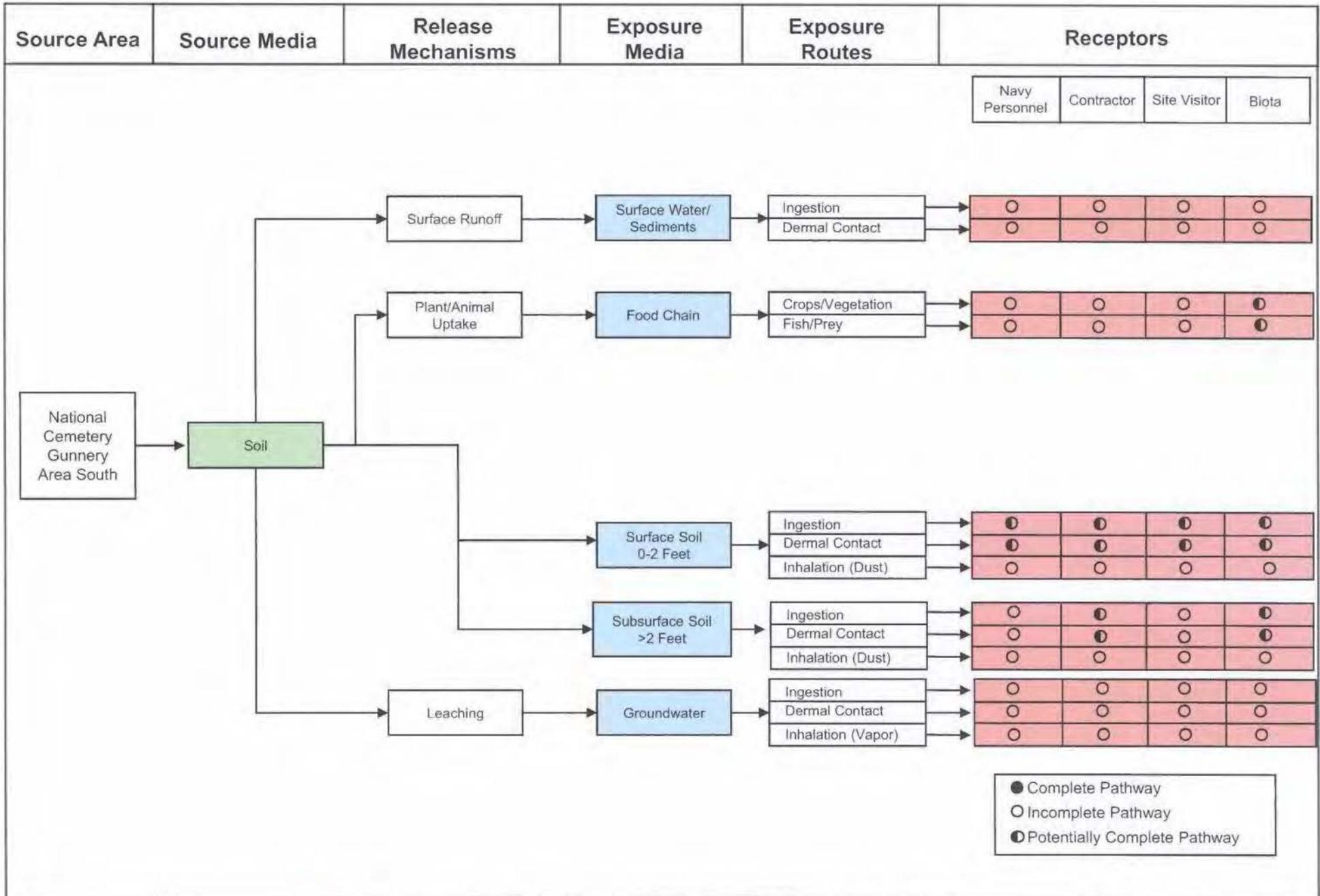
Surface Soil (0-2 feet): MC may be present in surface soils at the range in the vicinity of the Gunnery Area South. Potential receptors include Navy personnel conducting maintenance and utility maintenance on the site, contractors conducting environmental or ecological surveys on the range, site visitors, and biota that construct burrows or forage on the range. Potentially complete exposure pathways exist for receptors via ingestion and dermal contact. Inhalation exposure to MC in dust is unlikely for all receptors because most of the area is either paved or vegetated. Inhalation exposure to MC in dust is unlikely for all receptors because most of the area is either paved or vegetated. Inhalation exposure to MC in dust is unlikely in undeveloped areas, due to high precipitation in the area, which minimize dust and wind on the range.

Subsurface Soil (>2 feet): MC may be present in subsurface soil at the range due to migration from the overlying surface soil via leaching mechanisms. Although there are no current or planned intrusive activities at the range, contractors may be exposed to MC in the subsurface soil in the event of future environmental investigations or construction. Some biota (e.g., squirrels) may also be exposed to MC in subsurface soil while burrowing. Potentially complete exposure pathways therefore exist for these receptors via incidental ingestion, dermal contact, and inhalation of dust caused by subsurface drilling or soil excavation (including burrowing). Navy personnel and site visitors are unlikely to come in contact with MC in the subsurface soil, since no intrusive activities at the range would be conducted by these groups. Therefore, exposure pathways are considered incomplete for these receptors.

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Groundwater: The depth to groundwater north of the National Cemetery Gunnery Area South at OU 13 has been observed between 5.5 feet and 9 feet bgs. Based on the Record of Decision for IR Sites 8 and 24, groundwater at OU 13 is currently observed by a groundwater monitoring system and is not used for potable water. The main source of potable water for NAS Pensacola is a well field located at NTTC Corry Station, located to the north of Bayou Grande. No activities are conducted at the site that would result in contact with groundwater. Therefore, groundwater exposure pathways are considered to be incomplete for all receptors.

Food Chain: MC in soil may be bioaccumulated by plants or consumed by animals foraging on the range. Predation of prey and/or consumption of vegetation on the range may result in bioaccumulation of MC. Potentially complete exposure pathways are identified for biota that may be exposed to MC through the food chain. The Gunnery Area South does not have areas for fishing or hunting within the vicinity; therefore, exposure pathways are considered to be incomplete for human receptors.



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PIRNIE**

Munitions Characterization
National Cemetery Gunnery Area South

Legend

-  Installation Boundary
-  Range Boundary
-  Site Boundary
-  Historical Site Features
-  Clay Fragments
-  Firing Line
-  Berm
-  Firing Point
-  Munitions Debris
- MEC Presence***
-  Known
-  Suspect

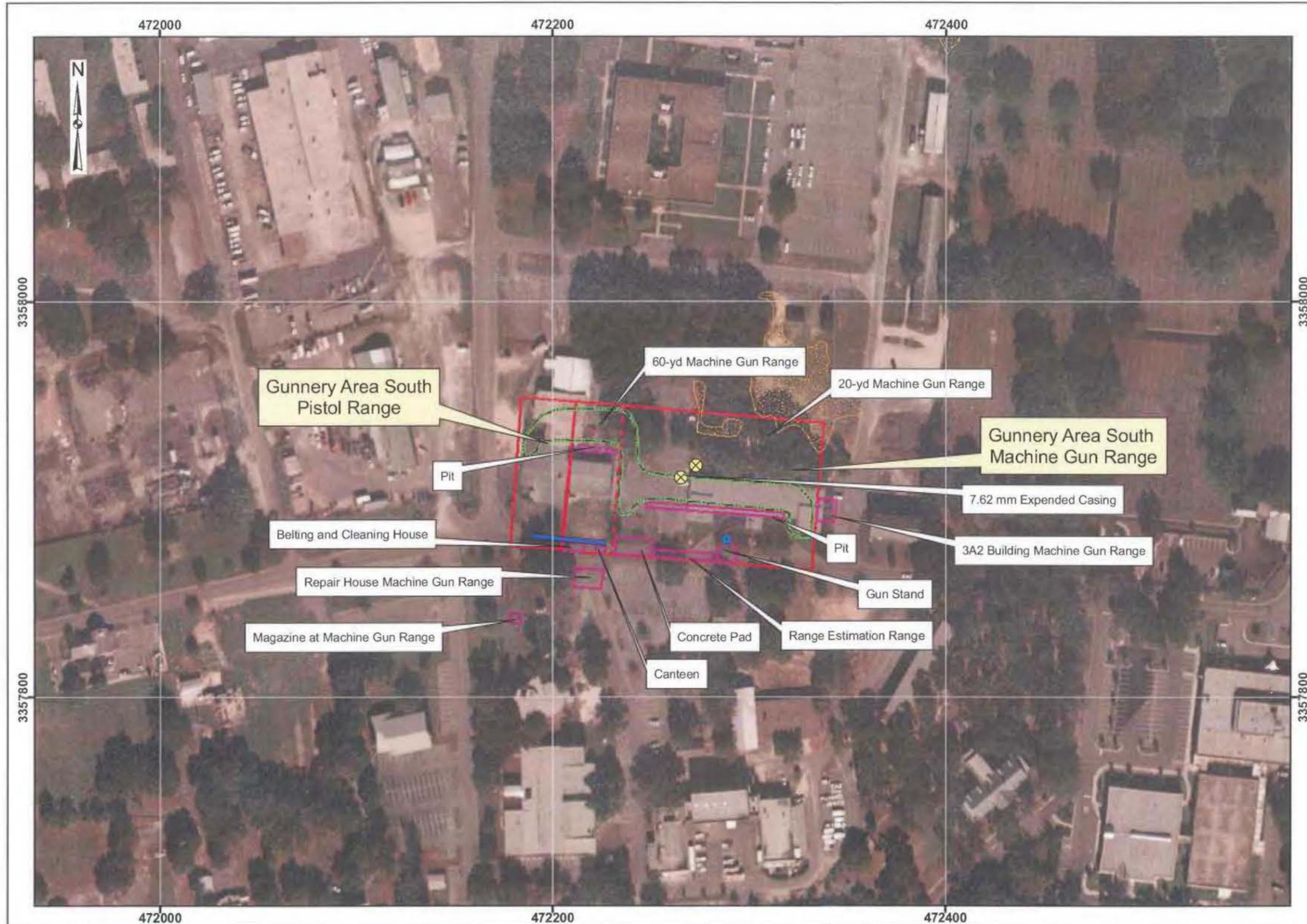
*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.



Data Source: NAS Pensacola, GIS Data, 2007.
Map of Fire Districts, Naval Air Station, Pensacola, FL, Sept. 4, 1937.
Map of Hospital and Vicinity, Naval Air Station, Pensacola, FL, Showing Conditions on June 30, 1941.
Map of Hospital and Vicinity, Naval Air Station, Pensacola, FL, Showing Conditions on June 30, 1943.
Map of Naval Reservation, Pensacola, FL, Showing Conditions on June 30, 1939.
Map of Hospital and Vicinity, Naval Air Station, Pensacola, FL, Showing Conditions on June 30, 1947.
Naval Air Station Pensacola, FL Gunnery Range March 8, 1949.

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
Edition: Interim Conceptual Site Model
Date: July 2008



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Preface

This interim deliverable provides the Navy with a summary of information collected to date and the data sources used to support the Conceptual Site Model (CSM). It summarizes our current understanding of the site, presented in the attached Information Profiles. It also provides draft Graphical Presentations of the site layout and CSM. The Information Profiles and the Graphical Presentations will serve as the basis of the CSM section of the Preliminary Assessment (PA) Report.

This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. Bayou Grande intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center; Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

The National Cemetery Gunnery Area North covers approximately 12 acres in the central portion of NAS Pensacola. The majority of the Gunnery Area North is located within the northwestern portion and along the western boundary of Barrancas National Cemetery. It is comprised of four historical ranges, including a Machine Gun Range, a Pistol Range, a Rifle Range, and a Firing Stand. The munitions usage and period of usage for each of the ranges in the Gunnery Area North varies, and each is discussed separately below.

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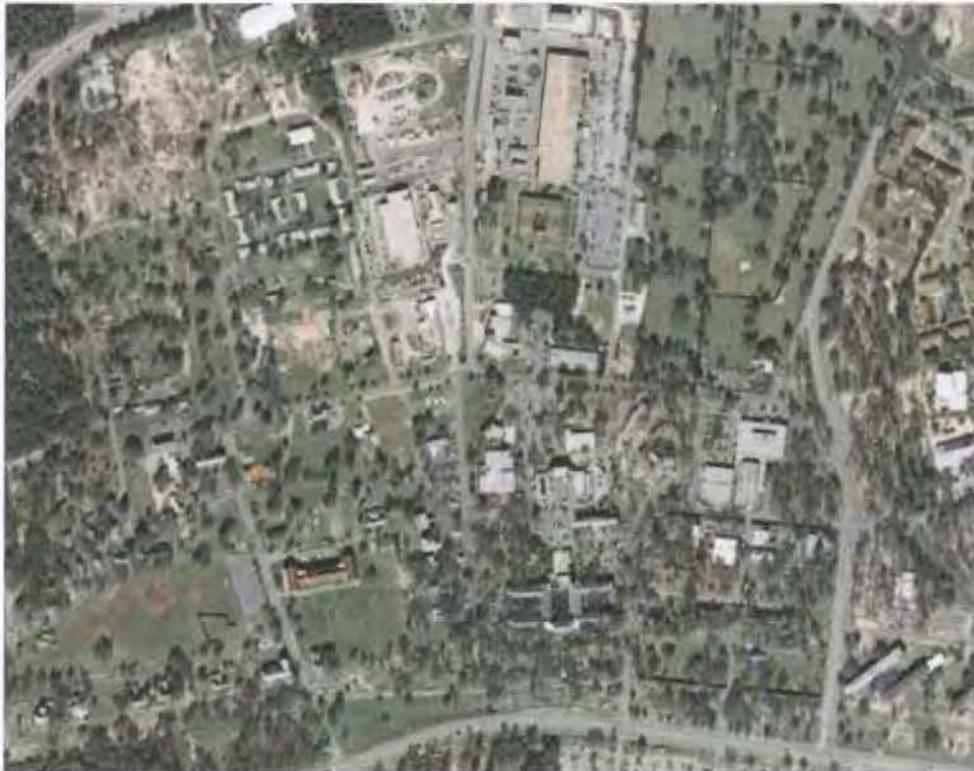


Figure 1: Aerial photograph of Barrancas National Cemetery

The **Gunnery Area North Machine Gun Range** is a 5.6-acre historical range located on the western edge of Barrancas National Cemetery, near John Tower Road. Based on historical maps dated 1940 and 1941, the eastern portion of the range was originally a Pistol Range with a berm (Figure 2). A 1942 map shows that the berm for the Pistol Range was extended westward (Figure 3), and the entire range and berm are later referred to as the Machine Gun Butt on maps dated 1943, 1944, 1947, 1950, and 1954. The 1943 map (Figure 4) lists the following structures for the Machine Gun Range: Ammunition House, Machine Gun Cleaning Building, Range House, Ammunition Belting House, and Boresighting Shelter. The map also shows 25-meter and 50-meter firing lines south of the berm.

The National Cemetery Skeet and Trap Ranges site, which is a separate site being investigated in this PA, is located south of the Gunnery Area North, and the surface danger zone (SDZ) for the Skeet Range overlaps the center portion of the Gunnery Area North Machine Gun Range. Because shotfall from the Skeet Range could have landed within the Gunnery Area North Machine Gun Range boundaries, expected munitions used at the Skeet Range are included as potential ammunition associated with the Gunnery Area North Machine Gun Range. No additional information regarding munitions use associated with this range was obtained during the archival data search.

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Figure 2: Original Pistol Range as shown on a 1940 Map of NAS Pensacola

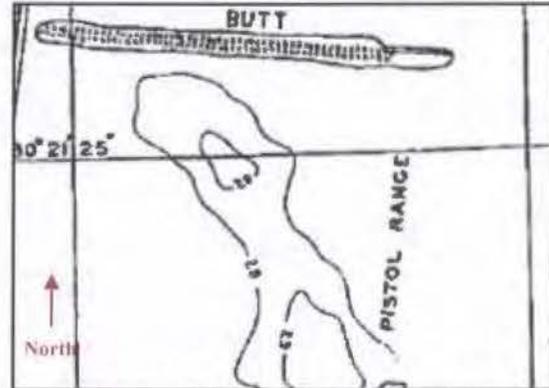


Figure 3: Original Pistol Range with extended berm as shown on a 1942 Map of NAS Pensacola

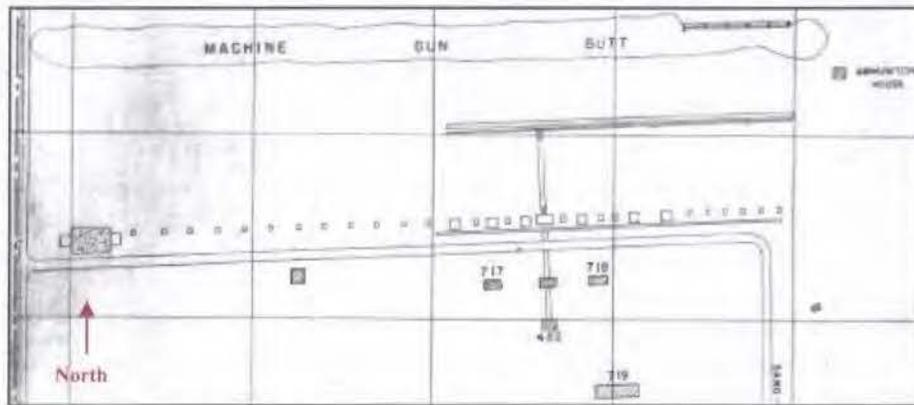


Figure 4: Gunnery Area North Machine Gun Range as shown on a 1943 Map of NAS Pensacola

The Gunnery Area North Pistol Range is located just east of the Gunnery Area North Machine Gun Range and covers approximately 1.4 acres. The range is illustrated on historical maps dated 1947 (Figure 5), 1949, 1950, and 1954. The map dated 1949 shows the most detail for the range. There was a 50-yard firing line on the eastern half of the range with 15 shooting tables and 15 stationary targets on the southern face of the berm (i.e., firing took place from south to north). The western half of the range contained 25-yard and 15-yard firing lines with 15 movable targets. According to historical documents, the Range House appears to be the only building associated with the range. No additional information regarding munitions use associated with this range was obtained during the archival data search.

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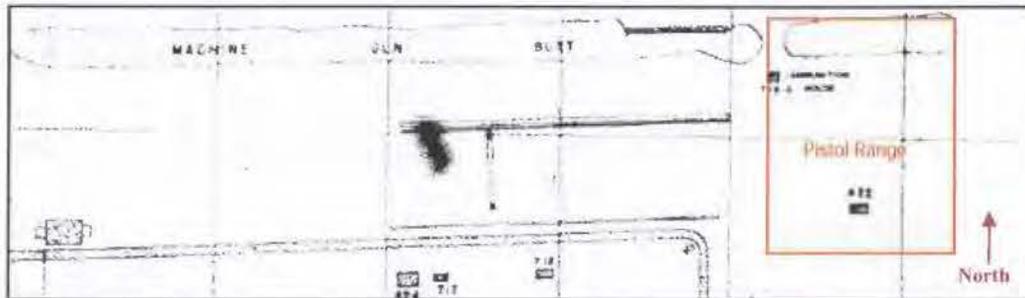


Figure 5: Gunnery Area North Pistol Range as shown on a 1947 Map of NAS Pensacola

The **Gunnery Area North Rifle Range** covers approximately 4.1 acres and is oriented north to south along the western boundary of Barrancas National Cemetery. The range is shown on historical maps dated 1933, 1939, and 1940. Each of the maps shows a berm located at the north end of the range, and the 1933 map shows four firing lines at varying distances on the south side of the berm (Figure 6). No additional information regarding munitions use associated with this range was obtained during the archival data search.

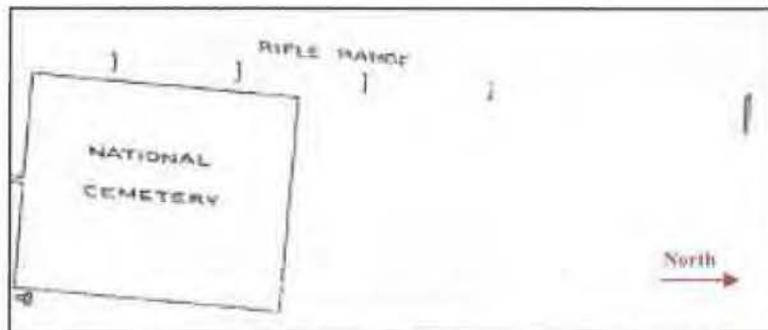


Figure 6: Gunnery Area North Rifle Range berm with four firing lines south of berm, 1933 historical map

The **Gunnery Area North Firing Stand** covers approximately 0.45 acres and is shown on historical maps dated 1944 and 1947 (Figure 7). The stand had a three-walled butt located just to its south; however, no additional information regarding munitions use associated with this range was obtained during the archival data search.

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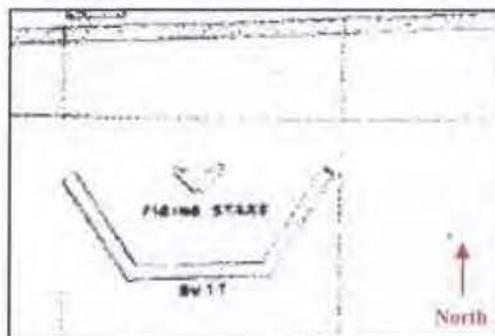


Figure 7: Gunnery Area North Firing Stand, 1947 historical map

Two Installation Restoration (IR) Sites are located within the boundaries of the Gunnery Area North. IR Site 8 (Rifle Range Disposal Area) is located within the western portion of the Machine Gun Range and is within the boundaries of the Firing Stand. IR Site 24 (dichloro-diphenyl-trichloroethane [DDT] Mixing Area) lies adjacent to the western boundary of the Rifle Range. The two sites are collectively referred to as Operable Unit (OU) 13. Field investigations of OU 13 were conducted from 1995 to 1997, and soil and groundwater samples were collected and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), target analyte list (TAL) metals, cyanide, pesticides, and polychlorinated biphenyls (PCBs). Concentrations of lead and PAHs were detected below Preliminary Remediation Goals and NAS Pensacola reference concentrations. Cadmium and dieldrin were present in elevated levels in both soil and groundwater at these sites. Consequently, soil contaminated with these analytes was excavated from the sites in 2004. The Record of Decision for contaminated groundwater included the implementation of a groundwater monitoring plan to monitor expected contaminant reductions, as well as the implementation of land-use controls that restricted the use of the surficial aquifer until cleanup levels were achieved.

Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
- National Museum of Naval Aviation
- Historical Map Files, Building 458

Personal Interviews:

- Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department
- Mr. Jim Kane, Deputy Public Works Officer, NAVFAC SE Public Works Department Pensacola

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- Mr. Steve Ward, Real Property Management, NAVFAC SE Public Works Department Pensacola
- Commander Kristine Nielsen, Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Bill Taylor, NAVFAC SE Public Works Department Environmental
- Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE Public Works Department Pensacola
- Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc.
- Mr. Jeff Halstead, Exhibit Specialist, Fort Pickens State Park
- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park
- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

A visual survey of the National Cemetery Gunnery Area was conducted on 30 November 2007 during the site visit. Malcolm Pirnie team members Ms. Susan Burnett, Ms. Angela Nolan, and Mr. Dan Hains were present. The purpose of the visual survey was to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), any evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site.

The visual survey consisted of walking the range vicinity to determine the presence/absence of MEC and MC within and along the periphery of the site. The Gunnery Area North Machine Gun Range and Gunnery Area North Pistol Range are currently within the northwestern portion of Barrancas National Cemetery. The Firing Stand has been paved-over and lies beneath the asphalt parking lot located to the south of the cemetery. No evidence of range features or historical range activities were observed within these range boundaries. Building 3857 (Storage), Building 462 (Armory), and Building 702 (Maintenance Shop) are located in the southern half of the Gunnery Area North Rifle Range. No munitions debris was observed at the Gunnery Area North Rifle Range; however, a small density of clay target fragments was observed in the center of the site just east of the National Cemetery Skeet Range SDZ. No MEC were observed in the Gunnery Area North.



Figure 8: General site conditions at Gunnery Area North, November 2007



Figure 9: General site conditions at Gunnery Area North, west of Barrancas National Cemetery, November 2007

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Documents and Reports:

- Final Initial Assessment Study of Naval Air Station Pensacola, Florida, June 1983
- Naval Air Station Master Plan, Naval Complex Pensacola, May 1989
- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Remedial Investigation Report Addendum, Operable Unit 13 - Sites 8 and 24, NAS Pensacola, Florida, September 1999
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010
- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001
- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004
- Final Integrated Cultural Resources Management Plan, NAS Pensacola, Escambia County, Volume 1, February 2004
- Interim Removal Action Report, Excavation of Contaminated Soil at Operable Unit 13 - Site 8, NAS Pensacola, Florida, October 2004
- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006
- Record of Decision for Operable Unit 13 (Sites 8 and 24), NAS Pensacola, Florida, September 2006

Websites:

- www.naspensacola.navy.mil (Installation Information)
- www.pensacolane newcomersguide.com/military.shtml (Installation Information)

Maps:

- Map of Naval Reservation Pensacola, Florida, Showing Conditions on 30 June 1933
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on 30 June 1939
- NAS Pensacola, Florida, Map of Fire Districts, 30 June 1940
- Map of Hospital and Vicinity, NAS Pensacola, Florida, Showing Conditions on 30 June 1941
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on 30 June 1942
- Map of Hospital and Vicinity, NAS Pensacola, Florida, Showing Conditions on 30 June 1943
- [Illegible Title] Map of Pistol Range, NAS Pensacola, Florida, 1944
- Naval Air Training Bases, Pensacola, Gunnery Range, Location Plan of Proposed Utilities, 1944
- Map of Main Station Gunnery Range Extension of Water Main to Machine Gun Butt, 1944
- Map of Hospital and Vicinity, NAS Pensacola, Florida, Showing Conditions on 30 June 1947
- Naval Air Training Bases, NAS Pensacola, Gunnery Range, Outdoor Pistol Range Plan and Details, 1949
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on 30 June 1950
- NAS Pensacola, Painting of Ten Buildings, Location Plan, 1 June 1954

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The historical records found at the National Archives provided information regarding the National Cemetery Gunnery Area North. Four ranges within the Gunnery Area North were shown on various historical maps dated 1933 through 1954. In addition, the interviews with Navy personnel provided valuable information about the ranges.

Information Profiles

Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	National Cemetery Gunnery Area North
Range/Site Location	The National Cemetery Gunnery Area North covers the northwestern portion and western boundary of Barrancas National Cemetery at NAS Pensacola in Escambia County, Florida. It lies east of Perdido Bay, west of Pensacola Bay, and north of the Gulf of Mexico.
Range/Site History	Four ranges are associated with the Gunnery Area North: a Machine Gun Range, Pistol Range, Rifle Range, and Firing Stand, which are shown on various historical maps dated 1933 through 1954. No other information regarding the history of the Gunnery Area North was identified.
Range/Site Area and Layout	The Gunnery Area North is approximately a 12-acre site located in the western portion of Barrancas National Cemetery at NAS Pensacola, and is comprised of four former ranges. The Gunnery Area North Machine Gun Range and Gunnery Area North Pistol Range are located in the northwestern portion of the cemetery, the Gunnery Area North Firing Stand is located just south of Gunnery Area North Machine Gun Range beneath the asphalt parking lot for Building 3561, and the Gunnery Area North Rifle Range is oriented north to south along the western boundary of the cemetery. The acreage of the site is representative of the footprint of the range area.

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Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Range/Site Structures	The Gunnery Area North Machine Gun Range and Gunnery Area North Pistol Range are located in the Barrancas National Cemetery. The western wall of the cemetery is located in the center of the Gunnery Area North Rifle Range, and the remainder of the range includes an asphalt parking lot, Building 3857 (Storage), Building 462 (Armory), and Building 702 (Maintenance Shop). The Gunnery Area North Firing Stand is covered by the asphalt parking lot for Building 3561. No range structures or evidence of former range structures exist in the Gunnery Area North or in the immediate vicinity.
Range/Site Boundaries	N: Barrancas National Cemetery; Taylor Road S: Paved and developed areas; Hovey Road W: Paved and developed areas; John Tower Road E: Barrancas National Cemetery; Duncan Road
Range/Site Security	A security check point must be passed to gain access to NAS Pensacola. Access to the Gunnery Area is not restricted from within the installation.

Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	Documentation of specific ordnance types used at the ranges was not identified; however, typical small arms usage for the ranges within the Gunnery Area North included the following: <ul style="list-style-type: none"> ▪ .22-caliber, .30-caliber, .45-caliber, and .50-caliber ammunition ▪ 20-millimeter ammunition ▪ 12-gauge, 16-gauge, 20-gauge, and .410-caliber shotgun ammunition No munitions debris was observed at the National Cemetery Gunnery Area North.
Maximum Probability Penetration Depth	The maximum penetration depth into the backstop berm is estimated at 12 inches. Demolition of the range and site structures and construction and grading of former range areas may have resulted in deposition of lead bullets and bullet fragments in the top one to two feet of soil at the site.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
MEC Density	Based on historical documentation, the Gunnery Area North was used for small arms training only. MEC or non-hazardous munitions-related scrap are not known or suspected to have been present at the site.
Munitions Debris	No munitions debris was observed in the National Cemetery Gunnery Area North. A small concentration of clay target fragments was observed in a gravel area in the center of the Gunnery Area North Rifle Range, just east of the SDZ for the National Cemetery Skeet and Trap Range.
Associated Munitions Constituents	<p>The primary MC associated with small arms ammunition is lead. Other MC may include antimony, arsenic, copper, zinc and constituents associated with black and/or smokeless powder; however, these constituents are less likely to be of concern as they are either present in only minor concentrations or are typically consumed when the small arms ammunition is fired.</p> <p>Clay pigeons were used as targets at the National Cemetery Skeet Range and Trap Range. Clay pigeons are typically bound together with petroleum products that contain polycyclic aromatic hydrocarbons (PAHs). Although PAHs are an associated MC, they tend to be tightly bound in the petroleum pitch and limestone matrix of the target and are therefore not readily available to the environment.</p> <p>Soil and groundwater sampling was conducted within the boundaries of the Gunnery Area North at OU 13. The samples were analyzed for VOCs, SVOCs, TAL metals, cyanide, pesticides, and PCBs. Concentrations of lead and PAHs were detected below Preliminary Remediation Goals and NAS Pensacola reference concentrations. Elevated levels of cyanide and dieldrin were found in both soil and groundwater at the sites, resulting in soil removal and the implementation of a groundwater monitoring system and land use controls regarding surficial aquifer use.</p>
Migration Routes/Release Mechanisms	Migration of MC from the Gunnery Area North may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake. Human activities, including maintenance (e.g. mowing) and grading, can cause MC migration. Future construction, excavation, or other site work could also serve as a migration/release mechanism.

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Climate	<p>The climate at NAS Pensacola is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.</p>
Topography	<p>The Gunnery Area North lies in a portion of NAS Pensacola that is approximately 20 feet to 30 feet above mean sea level. The topography at the installation is gently sloping; however, the Gunnery Area North is located in a paved and developed area, which has likely been graded to create the relatively flat surface in the vicinity of the area.</p>
Geology	<p>The Gunnery Area North is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface (bgs), and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).</p>
Soil	<p>According to the Soil Survey for Escambia County, soils at the former ranges are classified as Lakeland Sand, which are very deep, excessively drained, sandy soils with rapid permeability that are typically found on moderately-sloping broad ridges (USDA, 2004).</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWWMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWWMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWWMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for NAS Pensacola is a well field located at Naval Technical Training Center (NTTC) Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>Groundwater sampling at OU 13 indicates a north-northeast shallow groundwater flow in the vicinity of the Gunnery Area North. Soil saturation occurred seven feet to nine feet bgs for the majority of the samples collected, and depths to groundwater were 5.5 feet to nine feet bgs (Remedial Investigation Report Addendum OU 13, September 1999). Groundwater at OU 13 is currently observed by a groundwater monitoring system based on the 2006 Record of Decision for the IR Sites.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrology	<p>NAS Pensacola is bordered to the south by Big Lagoon, to the east and south by Pensacola Bay, and to the north by Bayou Grande. Drainage systems and storm drains feed into short intermittent streams which empty into the bays and bayou.</p> <p>No surface water features are located in the Gunnery Area North site boundary. Surface water runoff from the site drains into the storm water collection system for the area. Drainage for OU 13 is suspected to discharge into a wetland near the golf course, which is located 800 feet north of the down-gradient boundary of OU 13.</p>
Vegetation	<p>The majority of the Gunnery Area North is developed, and the associated vegetation includes small shrubs, oak trees, and manicured lawns associated with the cemetery and landscaped areas.</p>

Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	<p>The Gunnery Area North is located in the developed portion of NAS Pensacola. The northern and eastern portions of the site are within Barrancas National Cemetery. The western and southern portions of the site contain administration and office buildings, asphalt parking lots, and storage areas.</p>
Current Human Receptors	<p>Current human receptors include Navy personnel, contractors, and site visitors. Navy personnel and contractors may access the site to perform environmental or ecological studies or maintenance activities. Site visitors include visitors of the installation and Barrancas National Cemetery.</p>
Current Activities (frequency, nature of activity)	<p>Current activities include infrequent environmental/ecological investigations and regular maintenance activities by Navy personnel and/or contractors, and daily visitation to Barrancas National Cemetery by site visitors.</p>
Potential Future Land Use	<p>The potential future land use remains the same as the current land use, as no change in land use is planned.</p>
Potential Future Human Receptors	<p>Potential future human receptors remain the same as the current receptors, as no change in land use is planned.</p>

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Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Potential Future Land Use Related Activities	Potential future land use related activities consist remain the same as current land use related activities, as no change in land use is planned.
Zoning/Land Use Restrictions	Barrancas National Cemetery is located within a Historic District and expansions, renovations, or sitings of facilities within the district are governed by guidelines and procedures of the National Historic Preservation Act. As part of the 2006 Record of Decision for OU 13, use of the surficial zone within the Sand-and-Gravel Aquifer is restricted until cleanup levels for cadmium and dieldrin are achieved.
Beneficial Resources	No beneficial resources have been identified at the National Cemetery Gunnery Area North.
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (2000 Census). NAS Pensacola employees over 20,000 personnel and students.

Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	The Gunnery Area North is located in a completely developed area at NAS Pensacola and provides little suitable habitat for wildlife. Wildlife in the area is limited to birds and small mammals, such as squirrels.
Degree of Disturbance	The current and future land uses of the Gunnery Area North result in a high degree of disturbance to the habitat or ecological receptors.
Ecological Receptors	Terrestrial ecological receptors may include mammals (e.g., squirrels), terrestrial plants, and a variety of bird species. Currently, there are no known threatened or endangered species within the Gunnery Area North boundary.
Relationship of MEC/MC Sources to Habitat and Potential Receptors	Flora may assimilate MC in surface and/or subsurface soil, via plant uptake. Fauna may be exposed to MC in surface soil through ingestion, dermal contact, and inhalation, or by ingesting vegetation or prey organisms that may assimilate or bioaccumulate MC.

Graphical Presentations

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The attached Munitions Characterization Map and Exposure Pathway Analysis Figure provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Historical and visual evidence indicate that MEC are not present at the site; therefore, there are no complete exposure pathways for MEC. As such, an Exposure Pathway Analysis Figure for MEC was not created. However, information obtained and visual observations indicate that the potential for MC exists.

The Exposure Pathway Analysis figure provides a summary of complete, potentially complete, and incomplete exposure pathways for MC. For MC, interaction between the source (e.g., MC in surface soil) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

MC Exposure and Pathway Analysis

The pathway analysis for MC is shown in Figure 10. Potential receptors include both human (Navy personnel, contractor, and site visitors) and ecological (biota) receptors that may come in contact with MC in the source medium or other potentially contaminated media from the site. Pathways are shown for each exposure medium and are discussed below.

Surface Water/Sediment: MC may migrate from soil to surface water/sediment through surface water runoff. No surface water bodies are located in the Gunnery Area North or near vicinity; therefore, exposure pathways are considered incomplete for all receptors.

Surface Soil (0-2 feet): MC may be present in surface soils at the range in the vicinity of the Gunnery Area North. Potential receptors include Navy personnel conducting maintenance or utility maintenance at the site, contractors conducting environmental or ecological surveys on the range, site visitors, and biota that construct burrows or forage on the range. Potentially complete exposure pathways exist for these receptors via ingestion and dermal contact. Inhalation exposure to MC in dust is unlikely for all receptors because most of the area is either paved or vegetated. Inhalation exposure to MC in dust is unlikely in undeveloped areas, due to high precipitation in the area, which minimize dust and wind on the range.

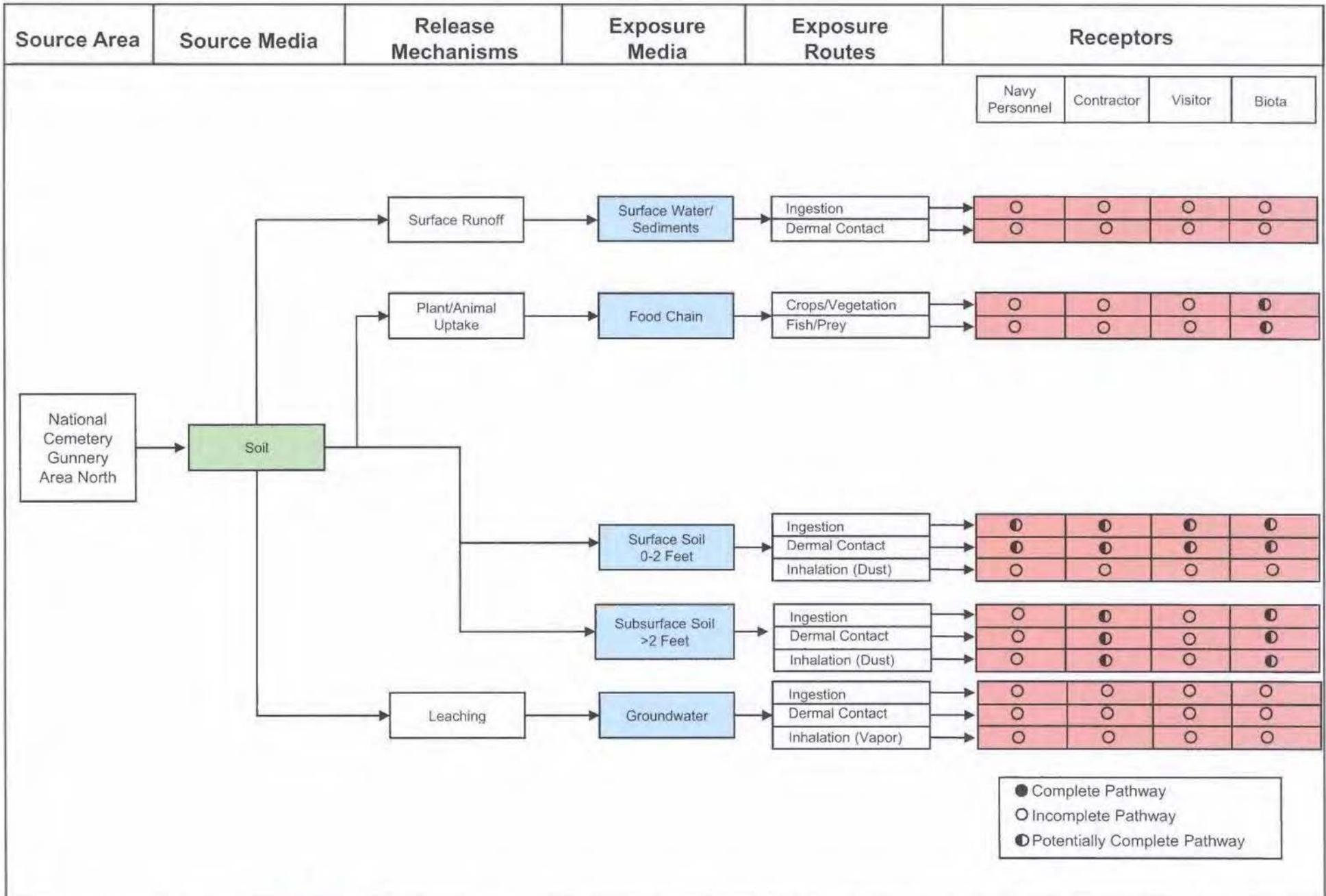
Subsurface Soil (>2 feet): MC may be present in subsurface soil at the range due to migration from the overlying surface soil via leaching mechanisms. Although there are no current or planned intrusive activities at the range, contractors may be exposed to MC in the subsurface soil in the event of future environmental investigations, utility maintenance, or construction. Some biota (e.g., squirrels) may also be exposed to MC in subsurface soil while burrowing. Potentially complete exposure pathways therefore exist for these receptors via incidental ingestion, dermal contact, and inhalation of dust caused by subsurface drilling or soil excavation (including burrowing). Navy personnel and site visitors are unlikely to come in

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contact with MC in the subsurface soil, since no intrusive activities at the range would be conducted by these groups. Therefore, exposure pathways are considered incomplete for these receptors.

Groundwater: Depths to groundwater have been recorded between 5.5 feet and 9 feet at OU 13 in the vicinity of the Gunnery Area North. Groundwater at OU 13 is currently observed by a groundwater monitoring system based on the 2006 Record of Decision for IR Sites 8 and 24, and the groundwater is not a source of potable water. The main source of potable water for NAS Pensacola is a well field located at NTTC Corry Station, located to the north of Bayou Grande. No activities are conducted at the site that would result in contact with groundwater; therefore, groundwater exposure pathways are considered to be incomplete for all receptors.

Food Chain: MC in soil may be bioaccumulated by plants or consumed by animals foraging on the range. Predation of prey and/or consumption of vegetation on the range may result in bioaccumulation of MC. Potentially complete exposure pathways are identified for biota that may be exposed to MC through the food chain. The Gunnery Area North does not have areas for fishing or hunting within the vicinity; therefore, exposure pathways are considered to be incomplete for human receptors.



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**MALCOLM
 PIRNIE**

Munitions Characterization
 National Cemetery Gunnery Area North

Legend

- Installation Boundary
- Range Boundary
- Site Boundary
- Historical Site Features
- Berm
- Clay Fragments
- Firing Line
- Target Line
- MEC Presence***
- Known
- Suspect

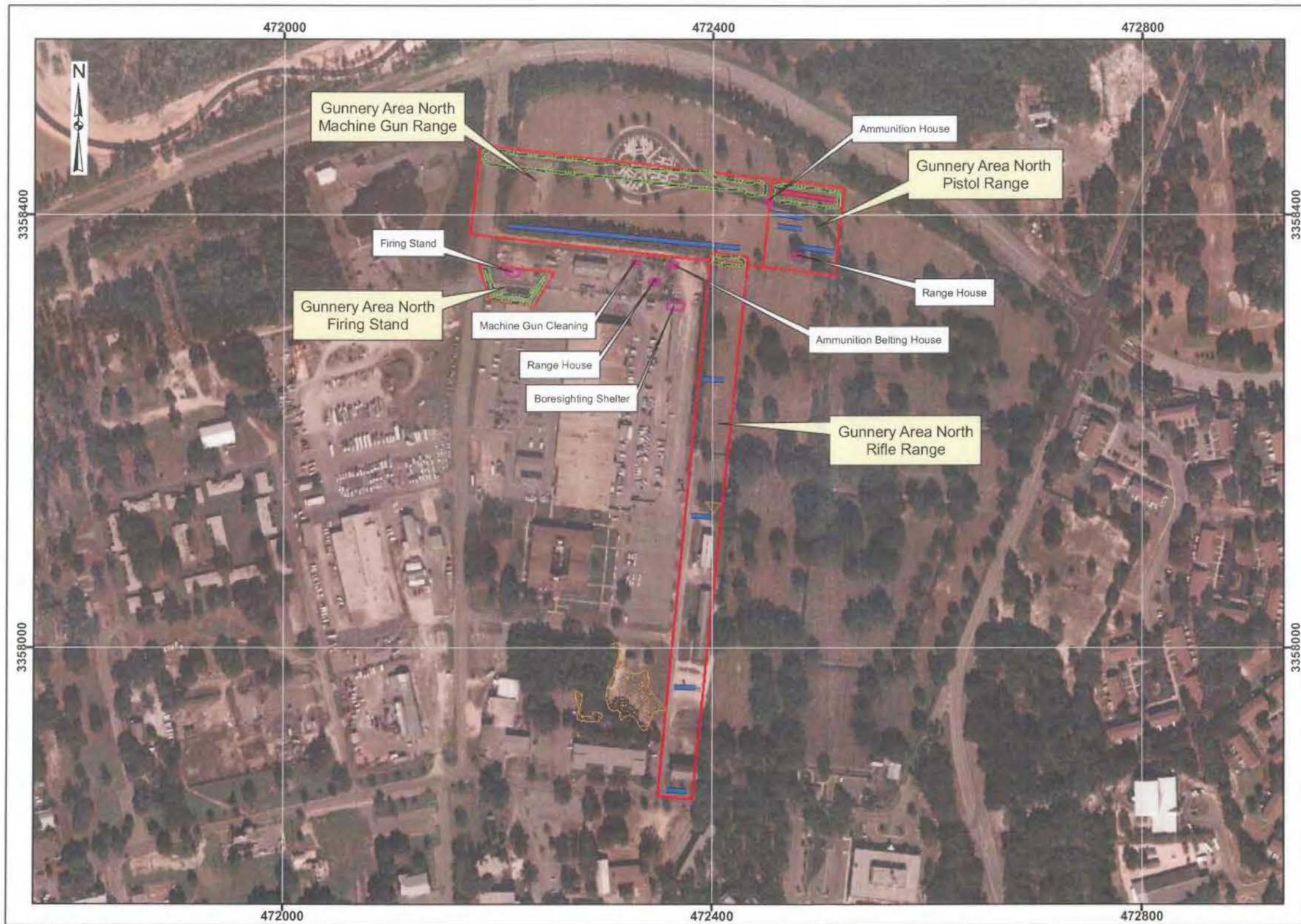
*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.



Data Source: NAS Pensacola, GIS Data, 2007.
 Map of Fire Districts, Naval Air Station, Pensacola, FL, Sept. 4, 1937.
 Map of Hospital and Vicinity, Naval Air Station, Pensacola, FL, Showing Conditions on June 30, 1941.
 Map of Hospital and Vicinity, Naval Air Station, Pensacola, FL, Showing Conditions on June 30, 1943.
 Map of Naval Reservation, Pensacola, FL, Showing Conditions on June 30, 1939.
 Map of Hospital and Vicinity, Naval Air Station, Pensacola, FL, Showing Conditions on June 30, 1947.
 Naval Air Station Pensacola, FL Gunnery Range March 8, 1949.

Coordinate System: UTM Zone 16N
 Datum: NAD83
 Units: meters

Contract: N62472-02-D-1300
 Edition: Interim Conceptual Site Model
 Date: July 2008



**Interim Conceptual Site Model Deliverable
Preliminary Assessment
National Cemetery Skeet and Trap Ranges
Naval Air Station Pensacola, Florida**

Preface

This interim deliverable provides the Navy with a summary of information collected to date and the data sources used to support the Conceptual Site Model (CSM). It summarizes our current understanding of the site, presented in the attached Information Profiles. It also provides draft Graphical Presentations of the site layout and CSM. The Information Profiles and the Graphical Presentations will serve as the basis of the CSM section of the Preliminary Assessment (PA) Report.

This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. Bayou Grande intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center; Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

The National Cemetery Skeet and Trap Ranges are located in the central portion of NAS Pensacola. The ranges are located west of Barrancas National Cemetery, which is north of Hovey Road.

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Figure 1: Aerial photograph of Barrancas National Cemetery

The site is comprised of two historical ranges: a Skeet Range and a Trap Range. The Skeet Range was shown on one historical map dated 1940. The map shows two structures which were likely the high and low houses for the range. Based on the orientation of the houses and the location of the cemetery to the east, it is assumed that fire was directed from east to west. The surface danger zone (SDZ) for the Skeet Range covers approximately 29.5 acres. The Trap Range was shown on historical maps dated 1941 and 1942. Based on the 1941 map, the firing line was located in the southeast corner of the site, and fire was directed to the northwest. The only structures associated with the Trap Range were the Trap House and the Clay Pigeon Storehouse. The SDZ for the Trap Range covers approximately 4.5 acres and is located within the SDZ of the Skeet Range.

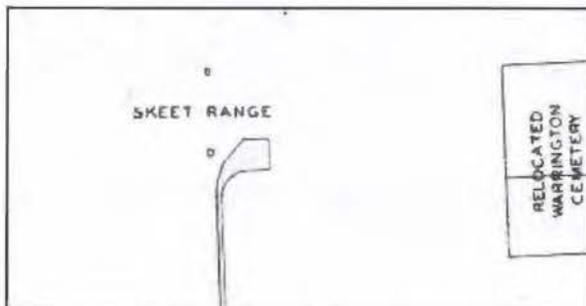


Figure 2: Skeet Range, 1940 historical map

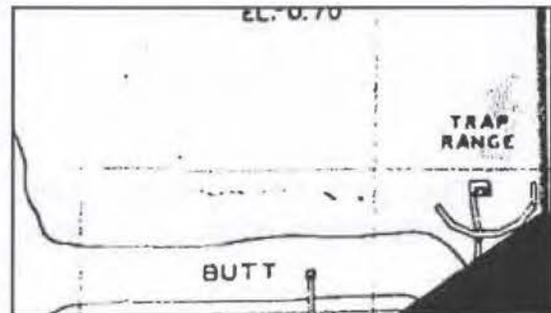


Figure 3: Trap Range, 1941 historical map

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The National Cemetery Skeet and Trap Ranges site boundary overlaps the boundaries of several other sites being investigated as part of this PA. These include the northeast boundary of the National Cemetery Gunnery Area South Machine Gun Range, the southern boundary of the National Cemetery Gunnery Area North Machine Gun Range, and the entire boundary of the National Cemetery North Firing Stand. Although the Skeet Range and Trap Range did not historically include a machine gun range or firing stand, MC and/or munitions debris associated with the usage of the machine gun ranges and Gunnery Area North Firing Stand may be present in the vicinity of the SDZ for the Skeet Range and Trap Range. No additional information regarding munitions use associated with this range was obtained during the archival data search.

Two Installation Restoration (IR) Sites are located in the western portion of the National Cemetery. IR Site 24 (dichloro-diphenyl-trichloroethane [DDT] Mixing Area) and IR Site 8 (Rifle Range Disposal Area) are located within the center of the Skeet Range SDZ, and a small section of the southern portion of IR Site 8 extends into the northern portion of the Trap Range SDZ. The two sites are collectively referred to as Operable Unit (OU) 13. Field investigations of OU 13 were conducted from 1995 to 1997, and soil and groundwater samples were collected and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), target analyte list (TAL) metals, cyanide, pesticides, and polychlorinated biphenyls (PCBs). The concentrations of PAHs and lead did not exceed Preliminary Remediation Goals (PRGs) or NAS Pensacola reference concentrations. Cadmium and dieldrin were present in elevated levels in both soil and groundwater at these sites. Consequently, soil contaminated with these analytes was excavated from the sites in 2004. The Record of Decision for contaminated groundwater included the implementation of a groundwater monitoring plan to monitor expected contaminant reductions, as well as the implementation of land-use controls that restricted the use of the surficial aquifer until cleanup levels were achieved.

Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
- National Museum of Naval Aviation
- Historical Map Files, Building 458

Personal Interviews:

- Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department
- Mr. Jim Kane, Deputy Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Steve Ward, Real Property Management, NAVFAC SE Public Works Department Pensacola
- Commander Kristine Nielsen, Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Bill Taylor, NAVFAC SE Public Works Department Environmental

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- Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE Public Works Department Pensacola
- Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc.
- Mr. Jeff Halstead, Exhibit Specialist, Fort Pickens State Park
- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park
- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

A visual survey of the National Cemetery Skeet and Trap Ranges was conducted on 30 November 2007 during the site visit. Malcolm Pirnie team members Ms. Susan Burnett, Ms. Angela Nolan, and Mr. Dan Hains were present. The purpose of the visual survey was to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), any evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site.

The visual survey consisted of walking the range vicinity to determine the presence/absence of MEC and MC within and along the periphery of the site. The Skeet and Trap Ranges site boundary currently begins at the northern portion of Barrancas National Cemetery and extends southwards across developed areas to the north side of Hovey Road. Building 3561 and the associated asphalt parking lot are located in the center portion of the range boundary. Building 488 (Naval Operational Medical Institute [NOMI] Headquarters) and the associated asphalt parking lot are currently located in the southern portion of the site boundary.

A small density of clay target fragments was observed directly east of the Skeet and Trap Ranges site boundary, in a gravel parking area within the National Cemetery Gunnery Area North Rifle Range boundary. Multiple areas with high densities of clay fragments were observed in an open lot in the southern portion of the SDZ. Clay fragments were also observed in the sand volleyball court north of Building 488. Munitions debris included multiple casings of expended copper 7.62-millimeter ammunition scattered in the volleyball court, in the sandy areas on the eastern edge of the parking lot, and along the north face of Building 488. The munitions debris was likely associated with the historical use of the National Cemetery Gunnery Area South Machine Gun Range, which is located within the Skeet and Trap Ranges site boundary.

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Figure 4: Clay target fragments, Skeet and Trap Ranges



Figure 5: Munitions debris from Gunnery Area South Machine Gun Range, Skeet and Trap Ranges SDZ

Documents and Reports:

- Final Initial Assessment Study of Naval Air Station Pensacola, Florida, June 1983
- Naval Air Station Master Plan, Naval Complex Pensacola, May 1989
- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Remedial Investigation Report Addendum, Operable Unit 13 - Sites 8 and 24, NAS Pensacola, Florida, September 1999
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010

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- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001
- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004
- Final Integrated Cultural Resources Management Plan, NAS Pensacola, Escambia County, Volume 1, February 2004
- Interim Removal Action Report, Excavation of Contaminated Soil at Operable Unit 13 - Site 8, NAS Pensacola, Florida, October 2004
- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006
- Record of Decision for Operable Unit 13 (Sites 8 and 24), NAS Pensacola, Florida, September 2006

Websites:

- www.naspensacola.navy.mil (Installation Information)
- www.pensacolaneewcomersguide.com/military.shtml (Installation Information)

Maps:

- Map of Naval Reservation Pensacola, Florida, Showing Conditions on 30 June 1933
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on 30 June 1939
- NAS Pensacola, Florida, Map of Fire Districts, 30 June 1940
- Map of Hospital and Vicinity, NAS Pensacola, Florida, Showing Conditions on 30 June 1941
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on 30 June 1942
- Map of Hospital and Vicinity, NAS Pensacola, Florida, Showing Conditions on 30 June 1943
- [Illegible Title] Map of Pistol Range, NAS Pensacola, Florida, 1944
- Naval Air Training Bases, Pensacola, Gunnery Range, Location Plan of Proposed Utilities, 1944
- Map of Main Station Gunnery Range Extension of Water Main to Machine Gun Butt, 1944
- Map of Hospital and Vicinity, NAS Pensacola, Florida, Showing Conditions on 30 June 1947
- Naval Air Training Bases, NAS Pensacola, Gunnery Range, Outdoor Pistol Range Plan and Details, 1949
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on 30 June 1950
- NAS Pensacola, Painting of Ten Buildings, Location Plan, 1 June 1954

The historical records found at the National Archives provided information regarding the National Cemetery Skeet and Trap Ranges. Two ranges within the Skeet and Trap Ranges site boundary were shown on various historical maps dated 1940 through 1942. In addition, the interviews with Navy personnel provided valuable information about the ranges.

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Information Profiles

Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	National Cemetery Skeet and Trap Ranges
Range/Site Location	The National Cemetery Skeet and Trap Ranges site is located on the western portion of Barrancas National Cemetery at NAS Pensacola in Escambia County, Florida. It lies east of Perdido Bay, west of Pensacola Bay, and north of the Gulf of Mexico.
Range/Site History	A Skeet Range and a Trap Range were historically located within the site boundary. The Skeet Range is depicted on one map dated 1940, and the Trap Range is depicted on maps dated 1941 and 1942. No other information regarding the history of the ranges was identified.
Range/Site Area and Layout	The Skeet and Trap Ranges site boundary is comprised of the two former ranges, and encompasses a 29.5-acre site located at NAS Pensacola. The site boundary begins at the southern boundary of Barrancas National Cemetery and extends south across developed areas north of Hovey Road. The 29.5-acre site includes footprint of the SDZs for the Skeet Range and Trap Range. The site boundary covers the central portion of the Gunnery Area North Machine Gun Range and the entire boundary of the Gunnery Area North Firing Stand. It also covers the northeastern portion of the Gunnery Area South Machine Gun Range.
Range/Site Structures	The northernmost portion of the Skeet and Trap Ranges site is located in Barrancas National Cemetery. Building 3561 and the associated parking lot are located within the center of the site. The south portion of the site includes Building 488 (NOMI Headquarters) and the associated parking lot. No evidence of former range structures currently exists in the Skeet and Trap Range site boundary or in the immediate vicinity.
Range/Site Boundaries	N: Barrancas National Cemetery; Taylor Road S: Hovey Road; paved and developed areas W: Paved and developed areas; John Tower Road E: Barrancas National Cemetery; Duncan Road

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Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Range/Site Security	A security check point must be passed to gain access to NAS Pensacola. Access to the Skeet and Trap Range is not restricted from within the installation.

Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	<p>Documentation on specific ordnance types used at the ranges was not identified; however, typical munitions historically used at skeet and trap ranges include 12-gauge, 16-gauge, 20-gauge, and .410-caliber shotgun ammunition.</p> <p>Because the SDZ overlaps two machine gun ranges and the Gunnery Area North Firing Stand, expected munitions used at these ranges are included as potential ammunition associated with the Skeet and Trap Range. These include .30-caliber, .50-caliber, and 20-millimeter ammunition.</p> <p>Munitions debris observed at the southern portion of the Skeet and Trap Range included multiple copper casings from expended lead .30-caliber bullets, which were likely used at the Gunnery Area South Machine Gun Range.</p>
Maximum Probability Penetration Depth	By design, skeet and trap ammunition is dispersed as pellets over a small area in the direction of fire. Demolition of former ranges and site structures and construction and grading of former range areas may have resulted in deposition of lead shot and broken clay targets in the subsurface soil at the site.
MEC Density	Based on historical documentation, the Skeet and Trap Ranges were used for small arms training only. MEC or non-hazardous munitions related scrap are not known or suspected to have been present at the site.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Debris	<p>Based on a visual survey, munitions debris are concentrated in the southern portion of the Skeet and Trap Range site. Multiple casings of expended copper 7.62-millimeter bullets are scattered along the north face of Building 488, on the eastern edge of the associated parking lot, and in the sand volleyball court north of the building. These are attributed to the historical use of this portion of the site as a machine gun range.</p> <p>A small concentration of clay target fragments was observed east of the site in a gravel parking area within the Gunnery Area North Rifle Range boundary. High densities of clay target fragments were also observed in the volleyball court and in the undeveloped lot north of Building 488.</p>
Associated Munitions Constituents	<p>The primary MC associated with small arms ammunition is lead. Other MC may include antimony, arsenic, copper, zinc and constituents associated with black and/or smokeless powder; however, these constituents are less likely to be of concern as they are either present in only minor concentrations or are typically consumed when the small arms ammunition is fired.</p> <p>Clay pigeons were used as targets at the National Cemetery Skeet Range and Trap Range. Clay pigeons are typically bound together with petroleum products that contain polycyclic aromatic hydrocarbons (PAHs). Although PAHs are an associated MC, they tend to be tightly bound in the petroleum pitch and limestone matrix of the target and therefore are not readily available to the environment.</p> <p>Soil and groundwater sampling was conducted within the boundaries for the Skeet and Trap Ranges at IR Site 8 and IR Site 24. The samples were analyzed for VOCs, SVOCs, TAL metals, cyanide, pesticides, and PCBs. The concentrations of PAHs and lead did not exceed Preliminary Remediation Goals (PRGs) or NAS Pensacola reference concentrations. Elevated levels of cyanide and dieldrin were found in both soil and groundwater at the sites, resulting in soil removal and the implementation of a groundwater monitoring system and land use controls regarding surficial aquifer use.</p>

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Migration Routes/Release Mechanisms	Migration of MC from the Skeet and Trap Ranges site may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake. Human activities, including maintenance (e.g. mowing) and grading, can cause MC migration. Future construction, excavation, or other site work could also serve as a migration/release mechanism.

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Climate	<p>The climate at NAS Pensacola is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.</p>
Topography	<p>The Skeet and Trap Ranges site lies in a portion of NAS Pensacola that is approximately 20 feet to 30 feet above mean sea level. The topography at the installation is gently sloping; however, the Skeet and Trap Ranges site is located in a paved and developed area, which has likely been graded to create the relatively flat surface in the vicinity of the area.</p>
Geology	<p>The Skeet and Trap Ranges site is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface (bgs), and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).</p>
Soil	<p>According to the Soil Survey for Escambia County, soils at the Skeet and Trap Range are classified as Lakeland Sand, which are very deep, excessively drained, sandy soils with rapid permeability that are typically found on moderately-sloping broad ridges (USDA, 2004).</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWWMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWWMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWWMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for NAS Pensacola is a well field located at Naval Technical Training Center Corry Station (NTTC), which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>Groundwater sampling at OU 13 indicates a north-northeast shallow groundwater flow within the Skeet and Trap Ranges and vicinity. Soil saturation occurred seven feet to nine feet bgs for the majority of the samples collected, and depths to groundwater were 5.5 feet to nine feet bgs (Remedial Investigation Report Addendum OU 13, September 1999). Groundwater at OU 13 is currently observed by a groundwater monitoring system based on the 2006 Record of Decision for IR Sites 8 and 24.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrology	<p>NAS Pensacola is bordered to the south by Big Lagoon, to the east and south by Pensacola Bay, and to the north by Bayou Grande. Drainage systems and storm drains feed into short intermittent streams, which empty into the bays and bayou.</p> <p>No surface water features are located within the Skeet and Trap Ranges site boundary. Surface water runoff from the site drains into the storm water collection system for the area. Drainage for OU 13 is suspected to discharge into a wetland near the golf course, which is located 800 feet north of the down-gradient boundary of OU 13.</p>
Vegetation	<p>The majority of the Skeet and Trap Ranges site is developed, and the associated vegetation includes small shrubs, oak trees, and manicured lawns associated with landscaped areas. A small, wooded area is located northwest of Building 488.</p>

Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	<p>The Skeet and Trap Ranges site is located in the developed portion of NAS Pensacola. The site contains administration and office buildings, asphalt parking lots, and storage areas.</p>
Current Human Receptors	<p>Current human receptors include Navy personnel, contractors, trespassers, and visitors. Navy personnel and contractors may access the site to perform environmental or ecological studies or maintenance activities. Human receptors also include visitors of Barrancas National Cemetery and the installation.</p>
Current Activities (frequency, nature of activity)	<p>Current activities include infrequent environmental/ecological investigations and regular maintenance activities by Navy personnel and/or contractors, and general visitation of Barrancas National Cemetery and the installation by site visitors.</p>
Potential Future Land Use	<p>The potential future land use remains the same as the current land use, as no change in land use is planned.</p>
Potential Future Human Receptors	<p>Potential future human receptors remain the same as the current receptors, as no change in land use is planned.</p>
Potential Future Land Use Related Activities	<p>Potential future land use related activities remain the same as current land use related activities, as no change in land use is planned.</p>

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Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Zoning/Land Use Restrictions	Barrancas National Cemetery is located within a Historic District, and expansions, renovations, or sitings of facilities within the district are governed by guidelines and procedures of the National Historic Preservation Act. As part of the 2006 Record of Decision for OU 13, use of the surficial zone of the Sand-and-Gravel Aquifer is restricted until cleanup levels for cadmium and dieldrin are achieved.
Beneficial Resources	No Beneficial Resources have been identified at the Skeet and Trap Ranges.
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (2000 Census). NAS Pensacola employees over 20,000 personnel and students.

Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	The Skeet and Trap Ranges site is located in a completely developed area at NAS Pensacola and provides little suitable habitat for wildlife. Wildlife in the area may be limited to birds and small mammals tolerant of urban development, such as squirrels.
Degree of Disturbance	The current and future land uses of the Skeet and Trap Ranges site results in a high degree of disturbance to the habitat or ecological receptors.
Ecological Receptors	Terrestrial ecological receptors may include mammals (e.g., squirrels), terrestrial plants, and a variety of bird species. Currently, there are no known threatened or endangered species in the Skeet and Trap Ranges site boundary.
Relationship of MEC/MC Sources to Habitat and Potential Receptors	Flora may bioaccumulate MC in surface and/or subsurface soil, via plant uptake. Fauna may be exposed to MC in surface soil through ingestion, dermal contact, and inhalation, or by ingesting vegetation or prey organisms that may bioaccumulate MC.

Graphical Presentations

The attached Munitions Characterization Map and Exposure Pathway Analysis Figure provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the

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Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Historical and visual evidence indicate that MEC are not present at the site; therefore, there are no complete exposure pathways for MEC. As such, an Exposure Pathway Analysis Figure for MEC was not created. However, information obtained and visual observations indicate that the potential for MC exists.

The Exposure Pathway Analysis figure provides a summary of complete, potentially complete, and incomplete exposure pathways for MC. For MC, interaction between the source (e.g., MC in surface soil) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

MC Exposure and Pathway Analysis

The pathway analysis for MC is shown in Figure 6. Potential receptors include both human (Navy personnel, contractor, site visitor) and ecological (biota) receptors that may come in contact with MC in the source medium or other potentially contaminated media from the site. Pathways are shown for each exposure medium and are discussed below.

Surface Water/Sediment: MC may migrate from soil to surface water/sediment through surface water runoff. No surface water bodies are located within the Skeet and Trap Ranges site boundary; therefore, exposure pathways are considered incomplete for all receptors.

Surface Soil (0-2 feet): MC may be present in surface soils at the range in the vicinity of the Skeet and Trap Range. Potential receptors include Navy personnel conducting maintenance or utility maintenance on the site, contractors conducting environmental or ecological surveys on the range, site visitors, and biota that construct burrows or forage on the range. Potentially complete exposure pathways exist for receptors via ingestion and dermal contact. Inhalation exposure to MC in dust is unlikely because most of the area is either paved or vegetated. Inhalation exposure to MC in dust in undeveloped areas is unlikely, due to the vegetation and high precipitation in the area, which minimize dust and wind on the range.

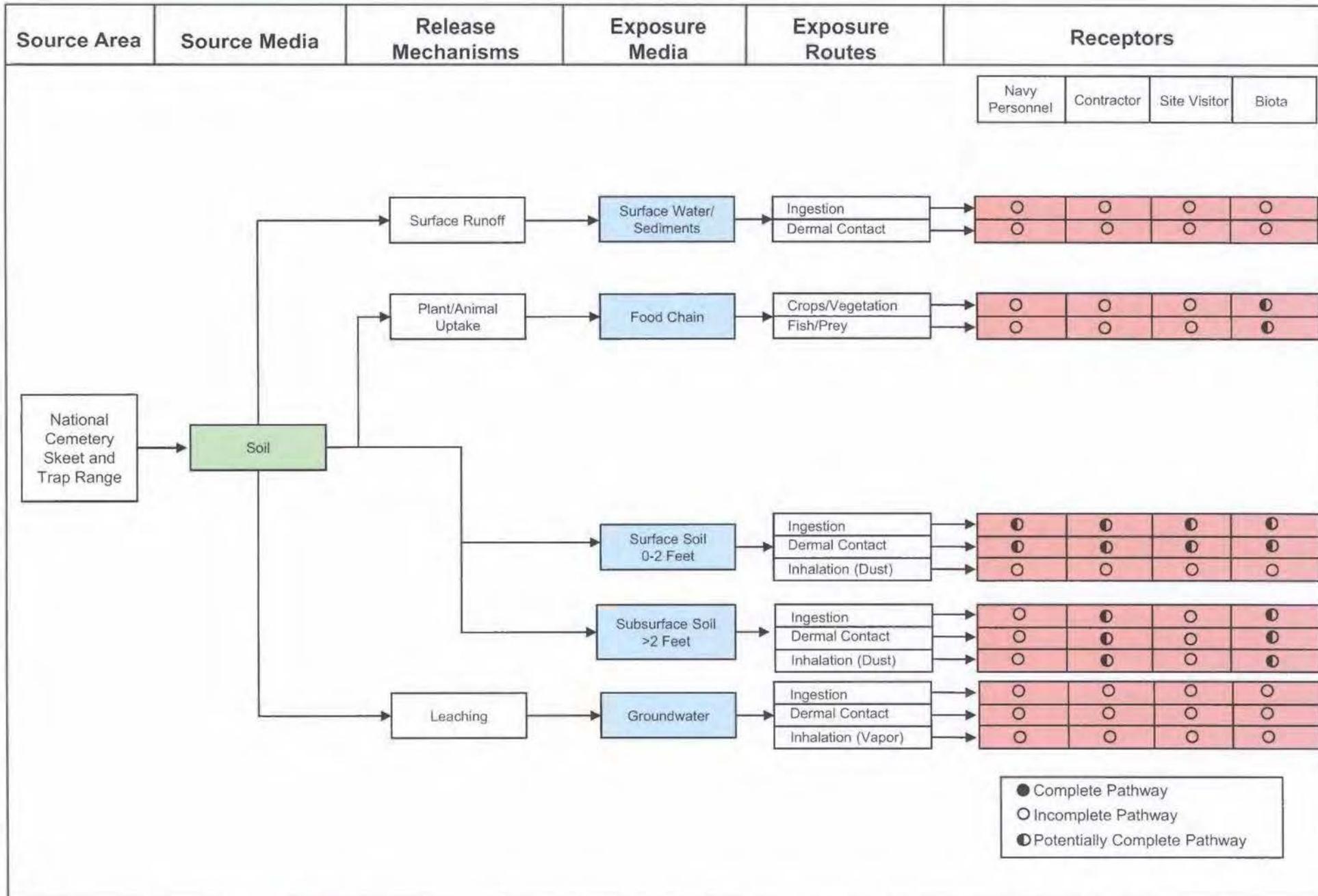
Subsurface Soil (>2 feet): MC may be present in subsurface soil at the range due to migration from the overlying surface soil via leaching mechanisms. Although there are no current or planned intrusive activities at the range, contractors may be exposed to MC in the subsurface soil in the event of future environmental investigations or construction. Some biota (e.g., squirrels) may also be exposed to MC in subsurface soil while burrowing. Potentially complete exposure pathways therefore exist for these receptors via incidental ingestion, dermal contact, and inhalation of dust caused by subsurface drilling or soil excavation (including burrowing). Navy personnel and site visitors are unlikely to come in contact with MC in the subsurface soil, since no intrusive activities at the range would be conducted by these groups. Therefore, exposure pathways are considered incomplete for these receptors.

Groundwater: The depth to groundwater in the vicinity of the Skeet and Trap Ranges boundary at OU 13 has been observed between 5.5 feet and 9 feet bgs. Based on the Record of Decision for IR Sites 8 and

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24 at OU 13, groundwater at OU 13 is currently observed by a groundwater monitoring system and is not used for potable water. The main source of potable water for NAS Pensacola is a well field located at NTTC Corry Station, located to the north of Bayou Grande. No activities are conducted at the site that would result in contact with groundwater. Therefore, groundwater exposure pathways are considered to be incomplete for all receptors.

Food Chain: MC in soil may be bioaccumulated by plants or consumed by animals foraging on the range. Predation of prey and/or consumption of vegetation on the range may result in bioaccumulation of MC. Potentially complete exposure pathways are identified for biota that may be exposed to MC through the food chain. The Skeet and Trap Ranges site does not have areas for fishing or hunting within the vicinity; therefore, exposure pathways are considered to be incomplete for human receptors.



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Munitions Characterization
 National Cemetery Gunnery Area
 Skeet and Trap Ranges

Legend

- Installation Boundary
- Range Boundary
- Site Boundary
- Surface Danger Zone
- Firing Line
- Historical Site Features
- Clay Fragments
- Munitions Debris
- MEC Presence***
- Known
- Suspect

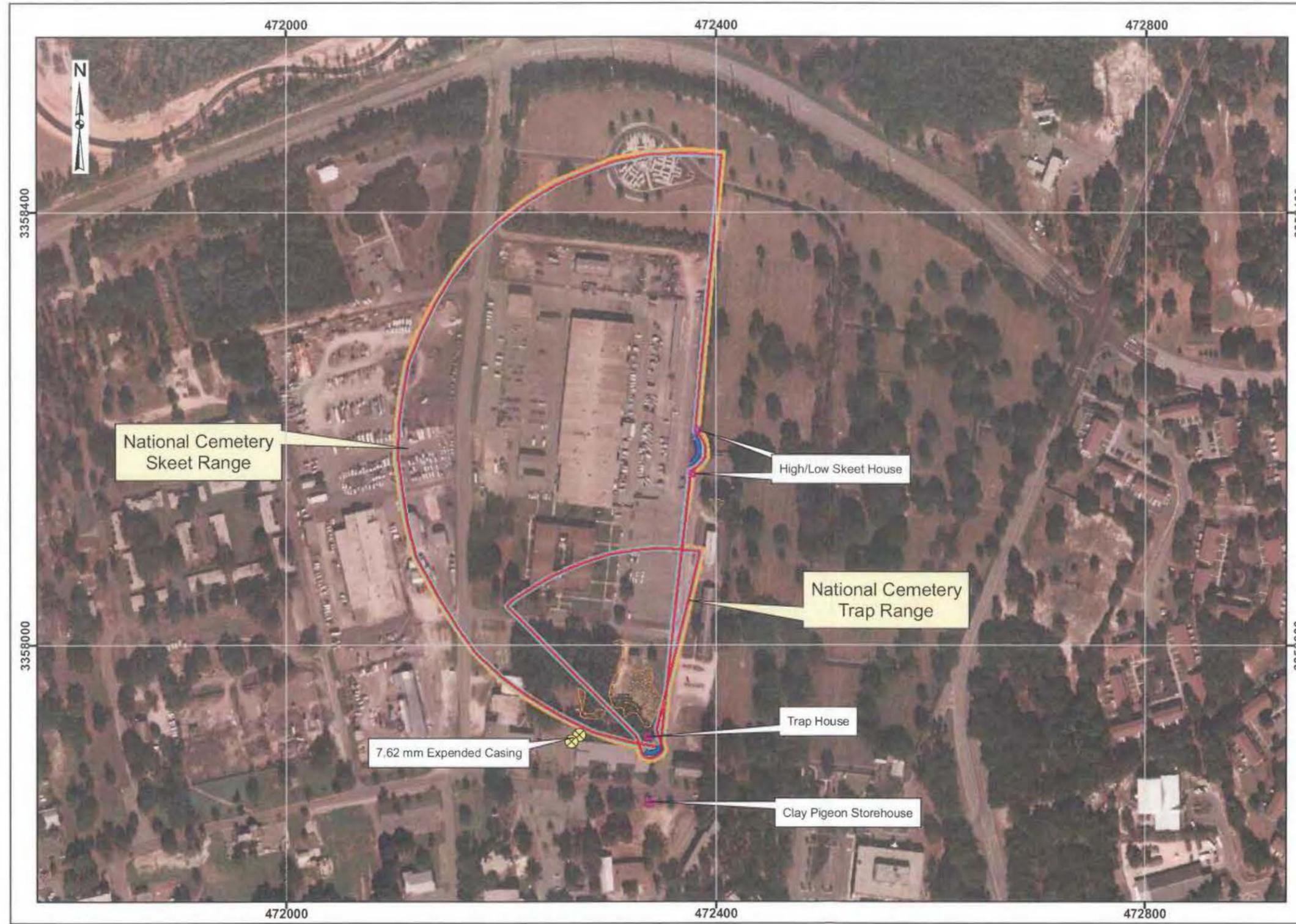
*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.



Data Source: NAS Pensacola, GIS Data, 2007.
 Map of Fire Districts, Naval Air Station, Pensacola, FL, Sept. 4, 1937.
 Map of Hospital and Vicinity, Naval Air Station, Pensacola, FL, Showing Conditions on June 30, 1941.
 Map of Hospital and Vicinity, Naval Air Station, Pensacola, FL, Showing Conditions on June 30, 1943.
 Map of Naval Reservation, Pensacola, FL, Showing Conditions on June 30, 1939.
 Map of Hospital and Vicinity, Naval Air Station, Pensacola, FL, Showing Conditions on June 30, 1947.
 Naval Air Station Pensacola, FL Gunnery Range March 8, 1949.

Coordinate System: UTM Zone 16N
 Datum: NAD83
 Units: meters

Contract: N62472-02-D-1300
 Edition: Interim Conceptual Site Model
 Date: July 2008



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Preliminary Assessment
Magazine Point Bombing Target
Naval Air Station Pensacola, Florida**

Preface

This interim deliverable provides the Navy with a summary of information collected to date and the data sources used to support the Conceptual Site Model (CSM). It summarizes our current understanding of the site, presented in the attached Information Profiles. It also provides draft Graphical Presentations of the site layout and CSM. The Information Profiles and the Graphical Presentations will serve as the basis of the CSM section of the Preliminary Assessment (PA) Report.

This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field, Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. The Bayou Grande bay intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center (NATTC); Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

Magazine Point is a peninsula within NAS Pensacola that is approximately four miles southwest of Pensacola, Florida, and is directly north of Chevalier Field. The area just south of the peninsula was initially the U.S. Navy Yard and Station, which according to historical records, was established in 1824 after the purchase of Florida from Spain (Young, 1910-1911). The U.S. Navy Yard and Station was used as a base for repairs and supplies to the American fleet engaged in the suppression of the slave trade and the

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final annihilation of the formidable buccaneers and piracy in the Gulf of Mexico, the Caribbean Sea, and adjacent waters (Young, 1910-1911). Woolsey, one of two villages that were initially established to provide housing for mechanics and skilled laborers brought down from the North to work at the U.S. Navy Yard and Station, was located just north of the U.S. Navy Yard and Station, at the base of the Magazine Point peninsula. These villages developed into successful communities, where some of the most social, cultivated, and exclusive families of Florida resided. Magazine Point later became part of NAS Pensacola, with the area just south of the peninsula becoming Chevalier Field in 1917, following the closing of the U.S. Navy Yard and Station in 1911. Chevalier Field is the original airfield for NAS Pensacola, which remained the naval air station's primary airfield until the 1950s. Currently, Chevalier Field is home to the NATTC, which was relocated to this site from Tennessee in 1996. The mission of the NATTC is to train Navy and Marine aviation personnel in the aeronautical technical phases of Navel Operation.



Figure 1: Aerial photograph of Magazine Point peninsula

The Magazine Point Bombing Target is an approximately 541-acre bombing target located approximately 800 feet north of Millington Avenue, which is the northern boundary of Chevalier Field, within the boundaries of the main NAS Pensacola installation. The range acreage was derived based on the entire surface danger zone (SDZ) boundary for a typical practice bombing range. However, the site boundary that this ICSM describes includes the bombing range denoted on historical maps and the area included within the 500 foot scoring arc which is a slightly smaller area. The Magazine Point Bombing Target was first denoted on a 1933 historical map, along with one powder magazine and a radio spotting system. The Magazine Point Bombing Target was not shown on a 1939 historical map; however a subsurface magazine and two other magazines were shown located on the west side of Magazine Point, as well as some temporary storehouses. The 1939 map also shows a 'Radio compass house' in the vicinity of where the Magazine Bombing Target had been located on the 1933 map. A 1946 historical map shows multiple structures labeled as 'Temporary storehouses' and 'Magazines' along the west side of Magazine Point. The

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1946 map also shows some structures on the east side and middle of Magazine Point that are not labeled. The location of the former Magazine Point Bombing Target includes the wastewater treatment plant for NAS Pensacola, undeveloped areas of Magazine Point, and a portion of Pensacola Bay. Based on historical maps, the period of use for the Magazine Point Bombing Target is approximately the 1930s. No additional archival records or references to the range were located that indicate direction of fire, munitions used, or construction details. However, given the proximity of the target to Chevalier Field, it is reasonable to assume that this was only a practice bombing range.



Figure 2: Map Excerpt showing Bombing Target in 1933

Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
- National Museum of Naval Aviation
- Historical Map Files, Building 458

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Personal Interviews:

- Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department
- Mr. Jim Kane, Deputy Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Steve Ward, Real Property Management, NAVFAC SE Public Works Department Pensacola
- Commander Kristine Nielsen, Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Bill Taylor, NAVFAC SE Public Works Department Environmental
- Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE Public Works Department Pensacola
- Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc.
- Mr. Jeff Halstead, Exhibit Specialist, Fort Pickens State Park
- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park
- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

A visual survey of the area around the Magazine Point Bombing Target was conducted on 30 November 2007 during the site visit. Malcolm Pirnie team members Ms. Susan Burnett, Ms. Cynthia Henderson, and Mr. Dan Hains were present. The purpose of the visual survey was to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), any evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site.

The location of the former Magazine Point Bombing Target is an area of Magazine Point including the NAS Pensacola Waste Water Treatment Plant (WWTP), undeveloped and unmaintained areas around the plant, and an area in Pensacola Bay. This area is north of Chevalier Field. The area from the shoreline adjacent to the Pensacola Bay shore up to the heavy vegetation line adjacent to the wastewater treatment plant fence was visually surveyed. Much of this area was covered with various storm debris washed up on the shore. Concrete and asphalt pieces were present in this area, as well. These materials may have been deliberately placed there either for shoreline stabilization or disposal, or they could be related to storm debris. The heavily vegetated area included thick growth of slash pines (*Pinus elliottii*), vines (*Smilax spp.*), and various shrubs such as saltbush (*Baccharis halimifolia*). Due to inaccessibility, the heavily vegetated area was not walked and the area inside the wastewater treatment plant was not walked. A large mound of dirt was observed just south of the Magazine Point Bombing Target. The history and use of that mound is unknown, but may be related to the presence of magazines in the area. No MEC or munitions debris were observed during the visual survey.

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Figure 3: View of heavy vegetation and soil mound at south end of site



Figure 4: View of vegetation on the Magazine Point Bombing Target

Documents and Reports:

- Contamination Assessment Report, Site 14, Building 3644, Naval Aviation Depot, Naval Air Station, Pensacola, FL, November 1995
- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- EPA Superfund Record of Decision: Pensacola Naval Air Station, EPA ID: FL9170024567, Operable Unit 10, 1997
- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Hough, J. W., Memo regarding "Bombs, Practice, 3-lb. Cast Iron, Request for. January 19, 1945
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010
- Memo regarding "Shipment of 3 lb practice bombs." July 12, 1944
- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006
- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004

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Websites:

- www.naspensacola.navy.mil (Installation Information)

Maps:

- Map of the Military Reservation at Fort Barrancas Florida, 1909
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on June 30, 1933
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on June 30, 1939
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on June 30, 1946

Historical records found at the National Archives for the Magazine Point Bombing Target included the maps referenced above. No records pertaining to specific use or maintenance of the range were located. The Contamination Assessment Report (CAR) completed in 1995 for Building 3644 was obtained on-base and includes information about sampling, geology, and hydrology for the nearby area. The Record of Decision for Operable Unit 10 (ROD) contains information regarding contamination in the vicinity of the wastewater treatment plant and includes information about contaminant levels as well as geology and hydrology for the surrounding area. Due to the age of the range and redevelopment of the site, interviews with Navy personnel provided no additional information about this range.

Information Profiles

Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	Magazine Point Bombing Target
Range/Site Location	Magazine Point Bombing Target is located north of Chevalier Field, within NAS Pensacola in Escambia County, Florida. It lies south of Bayou Grande on the shore of Pensacola Bay and north of the Gulf of Mexico.
Range/Site History	The bombing target was shown on a map dated 1933. No other information regarding the range history was reviewed or identified.
Range/Site Area and Layout	The Magazine Point Bombing Target is an approximately 541-acre site located north of Chevalier Field and within the main NAS Pensacola installation. The bombing target at the center of the range was depicted as a chevron shape pointing to the east.

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Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Range/Site Structures	The site of the Magazine Point Bombing Target is located on Magazine Point and includes undeveloped and unmaintained areas, the NAS Pensacola WWTP, and a portion of Pensacola Bay. A large mound of dirt was observed on the southern end of the area. Structures included within the 500-foot scoring arc are buildings associated with the WWTP. Building 3644 is southwest of the site along with another building south of the site.
Range/Site Boundaries	N: Undeveloped Magazine Point area S: Chevalier Field W: WWTP E: Pensacola Bay
Range/Site Security	A security check point must be passed to gain access to NAS Pensacola. Access to most of the site is unrestricted from inside the installation. The NAS Pensacola WWTP (aka Operable Unit 10) is fenced and has restricted access within NAS Pensacola.

Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	Specific ordnance types used at the range were not identified; however, due to the close proximity to Chevalier Field, ammunition used at the bombing targets likely included various sizes of practice bombs.
Maximum Probability Penetration Depth	The depth to which munitions penetrate below the ground surface depends on many factors, including the type of soil, the angle of impact, the size of the ammunition, the velocity at impact, and site-specific environmental conditions. Typical ordnance penetration depths for loamy soils range from 3.51 feet for 3-pound bombs to 7.12 feet for 25-pound bombs. However, at this site ammunitions could potentially occur at a variety of depths due to the dynamic nature of shorelines and the potential for rubble and other material to have been deposited on the shore for stabilization.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
MEC Density	While proximity to Chevalier Field probably limited use of munitions at this site to inert practice materials, those munitions still potentially contained spotting charges which would qualify as MEC. The density of MEC is unknown due to lack of information regarding the frequency of training at this site and or the number of ordnance items used at this site. Although MEC were not observed during the site visit, it is possible that munitions debris and/or MEC remains are on the range.
Munitions Debris	No evidence of munitions debris was identified during the visual survey.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Associated Munitions Constituents	<p>Due to the proximity to Chevalier Field, practice bombs were likely used at the Magazine Point Bombing Target. Inert fillers in typical practice bombs included water and/or sand. Spotting charges that potentially contained trace quantities of MC including titanium tetrachloride, red phosphorous, and pyrotechnics may also have been used.</p> <p>Groundwater sampling associated with an Underground Storage Tank (UST) CAR conducted in 1995 occurred at Building 3644, which is approximately 400 feet west-southwest of the site. During that study, lead was analyzed in groundwater and was found to be present but below 50 parts per billion (ppb) for most samples. In two samples where lead was detected above that level (330 ppb and 180 ppb) the concentrations were attributed to high turbidity. Lead soil samples were not reported in the 1995 CAR.</p> <p>Sampling that was documented in the record of decision (ROD) completed in 1997 for a closed portion of the wastewater treatment plant area (aka Operable Unit 10) included soil, sediment, surface water, shallow groundwater, intermediate groundwater, and deep groundwater sampling. Soil sampling showed various contaminants including cadmium, chromium, and lead. The only state or federal soil exceedances were for PAHs. For surface water samples, various contaminants including cadmium, chromium, and lead were present and cadmium and lead exceeded surface water standards. Groundwater sampling showed the presence of various contaminants including cadmium, chromium, lead, iron, and manganese. Cadmium and chromium were exceeded in one shallow well each while iron and manganese consistently exceeded limits. For intermediate and deep groundwater samples, cadmium, chromium, and beryllium exceeded limits in one intermediate well and iron and manganese consistently exceeded limits in both intermediate and deep groundwater wells. These chemicals were all linked to the former use of the WWTP as an industrial WWTP including treatment of waste high in organic solvents, phenols, chromium electroplating wastes, and waste from the conversion of aluminum.</p>

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Migration Routes/Release Mechanisms	<p>MEC migration may occur due to soil erosion. Surface runoff caused by precipitation may erode the surface soil, thus exposing buried MEC. Additionally, tidal action may move MEC from the beach to near-shore areas or vice versa.</p> <p>Migration of MC from the Magazine Point Bombing Target may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake. Human activities including maintenance (e.g. mowing) and grading or construction can cause MC migration. Planned and future construction, excavation, or other site work could also serve as a migration/release mechanism.</p>

Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Climate	<p>The climate at NAS Pensacola is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.</p>
Topography	<p>Magazine Point is located within the Gulf Coastal Lowlands which are generally characterized by poor drainage and elevations less than 40 feet above mean sea level on NAS Pensacola (INRMP, 2001). The Magazine Point Bombing Target area is a relatively flat area adjacent to the Pensacola Bay shore. It gently slopes to the north to a bayou flowing into Bayou Grande and to the east to Pensacola Bay.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Geology	<p>The Magazine Point Bombing Target is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface (bgs), and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).</p> <p>Soil borings from the eastern end of Building 3644 where the USTs were removed noted that the surficial and subsurface soil is typically very fine-grained to medium-grained quartz sand (CAR, 1995). More specific information about geology at the Magazine Point Bombing Target is unknown.</p>
Soil	<p>Based on the U.S. Department of Agriculture (USDA) Soil Survey for Escambia County, soils within the vicinity of the range include the Corolla soil series, which is a somewhat poorly-drained sandy soil. Pensacola Bay is located to the east of the site (USDA, 2004).</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWFMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWFMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWFMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for NAS Pensacola is a well field located at Naval Technical Training Center (NTTC) Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>Depth to groundwater at Building 3644 was measured at approximately five to seven feet below ground surface (bgs), as indicated in the 1995 CAR. Information from monitoring wells installed during the investigation showed groundwater contaminated with benzene, total volatile organic aromatics, naphthalene, and total recoverable petroleum hydrocarbons.</p>
Hydrology	<p>Pensacola Bay is located east of the site. Surface water runoff from the site drains directly into Pensacola Bay.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Vegetation	The immediate shoreline on Pensacola Bay has little vegetation. Slash pine, various vines and various shrubs such as saltbush are present in the vegetated areas adjacent to the shore with heavy growth of shrubs and vines. Areas within the WWTP are covered with turf grass.

Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	Current land use of the Magazine Point Bombing Target includes undeveloped, unmaintained areas; the WWTP; and Pensacola Bay.
Current Human Receptors	Current human receptors include Navy personnel, contractors, and trespassers/recreational users. Navy personnel and contractors may access the site to for maintenance issues. Trespassers may include naturalists who can access the site from within NAS Pensacola or recreational users who can access the site by boat from Pensacola Bay.
Current Activities (frequency, nature of activity)	Current activities include maintenance of the turf lawn at the WWTP as well as construction and maintenance at the WWTP by Navy personnel and/or contractors. The undeveloped area appeared to have no specific current use and Pensacola Bay is used recreationally for water sports and fishing.
Potential Future Land Use	No change in land use is planned.
Potential Future Human Receptors	Potential future human receptors consist of the current receptors, as no change in land use is planned.
Potential Future Land Use Related Activities	The NAS Pensacola wastewater treatment plant is currently undergoing construction and maintenance. Structures and usage of the site are still in the planning stages.
Zoning/Land Use Restrictions	Restrictions are associated with the WWTP due to the existing ROD. There are no known zoning/land use restrictions for the remainder of the Magazine Point Bombing Target.
Beneficial Resources	The site includes a portion of Pensacola Bay. Wetlands may exist within the WWTP area and along drainage ditches. There are no other known beneficial resources located at the Magazine Point Bombing Target.

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Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (U.S. Census, 2000). Approximately 14,720 civilian and military personnel are employed at NAS Pensacola (INRMP, 2001).

Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	The habitat in this area is composed of the shoreline and the adjacent heavily vegetated area with oaks, pines, and various shrubs and vines.
Degree of Disturbance	The current and future land uses of the Magazine Point Bombing Target results in a low degree of disturbance to the habitat or ecological receptors.
Ecological Receptors	Terrestrial ecological receptors may include mammals (e.g., foxes, bears, and squirrels), reptiles (e.g., tortoises), terrestrial plants, and a variety of bird species. Raptors such as osprey (<i>Pandion haliaetus</i>) are known to occur on the installation. Aquatic ecological receptors in nearby surface water may include various species of fish, amphibians, and aquatic/wetland vegetation. Currently, there are no known threatened or endangered species on the Magazine Point Bombing Target.
Relationship of MEC/MC Sources to Habitat and Potential Receptors	Ecological receptors can come into contact with MEC and MC through foraging and burrowing activities in surface soil. Additionally, aquatic ecological receptors may directly contact MEC and MC if present in the near-shore aquatic environment. Bioaccumulation of MC in plants and prey may also occur, resulting in food chain exposures to animals feeding in nearby waters or on the peninsula.

Graphical Presentations

The attached Munitions Characterization Map and Exposure Pathway Analysis Figures provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Based on the information obtained during the site visit (including observations made during the visual survey and data collected during the site visit), both MEC and MC potentially exist at the site.

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The Exposure Pathway Analysis provides a summary of complete or incomplete exposure pathways for MEC and MC. The potential interactions between the source and receptors are assessed differently between MEC and MC. For MEC, interaction between the potential receptors and an MEC source has two components. The receptor must have access to the source and must engage in some activity that results in contact with individual MEC items within the source area. For MC, interaction between the source (e.g., the berm) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

MEC Exposure and Pathway Analysis

The pathway analysis for MEC is shown in Figure 5. Potential receptors include Navy personnel, contractors, recreational users (e.g. fisherman or boaters), trespassers (e.g. naturalists), and biota. The various pathways are discussed below.

MEC in Surface Soil: While no evidence of MEC was noted on the surface, MEC may be present in surface soil at the site since an exhaustive search of the beach area was not conducted and some areas of the site were covered with thick vegetation or asphalt and concrete rubble. Additionally, erosion could uncover MEC present near the surface. Exposed MEC may be treaded on by Navy personnel, contractors performing surveys, or trespassers walking on the beach. Biota may also come into contact with MEC while foraging or digging.

MEC in Subsurface: MEC may be present in the subsurface due to erosion, redeposition mechanisms, and erosion control measures on the beach. MEC located near the beach could be covered and uncovered due to erosion over time. Erosion control measures, including deposition of asphalt and concrete rubble, appear to have taken place on the beach which could cover MEC present in the soil. Navy personnel, contractors, trespassers/recreational users, and biota may be exposed to MEC in the subsurface via erosion and potential to tread upon MEC. Such receptors may be exposed to MEC via intrusive activities such as digging by Navy personnel, and contractors, and foraging activities by ecological receptors.

MEC in Near Shore Sediments: MEC may also be present in the shallow, near-shore sediments surrounding the peninsula, due to possible transport from the beach area into the surrounding bays via tidal activity. MEC in the shallow sediment near the range would represent a possible hazard to Navy personnel or contractors working in the area, nearby recreational users such as boaters, and trespassers. Aquatic biota may also contact MEC in the near-shore sediments via foraging.

MC Exposure and Pathway Analysis

The pathway analysis for MC is shown in Figure 6. The Exposure Pathway Analysis figure provides a summary of complete, potentially complete, and incomplete exposure pathways for MC. For MC, interaction between the source (e.g., MEC or munitions debris) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium. Potential receptors

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include both human (Navy personnel, contractor, trespassers/recreational users utilizing the bay) and ecological (biota) receptors that may come in contact with MC in the source medium or other potentially contaminated media from the site. Pathways are shown for each exposure medium and are discussed below.

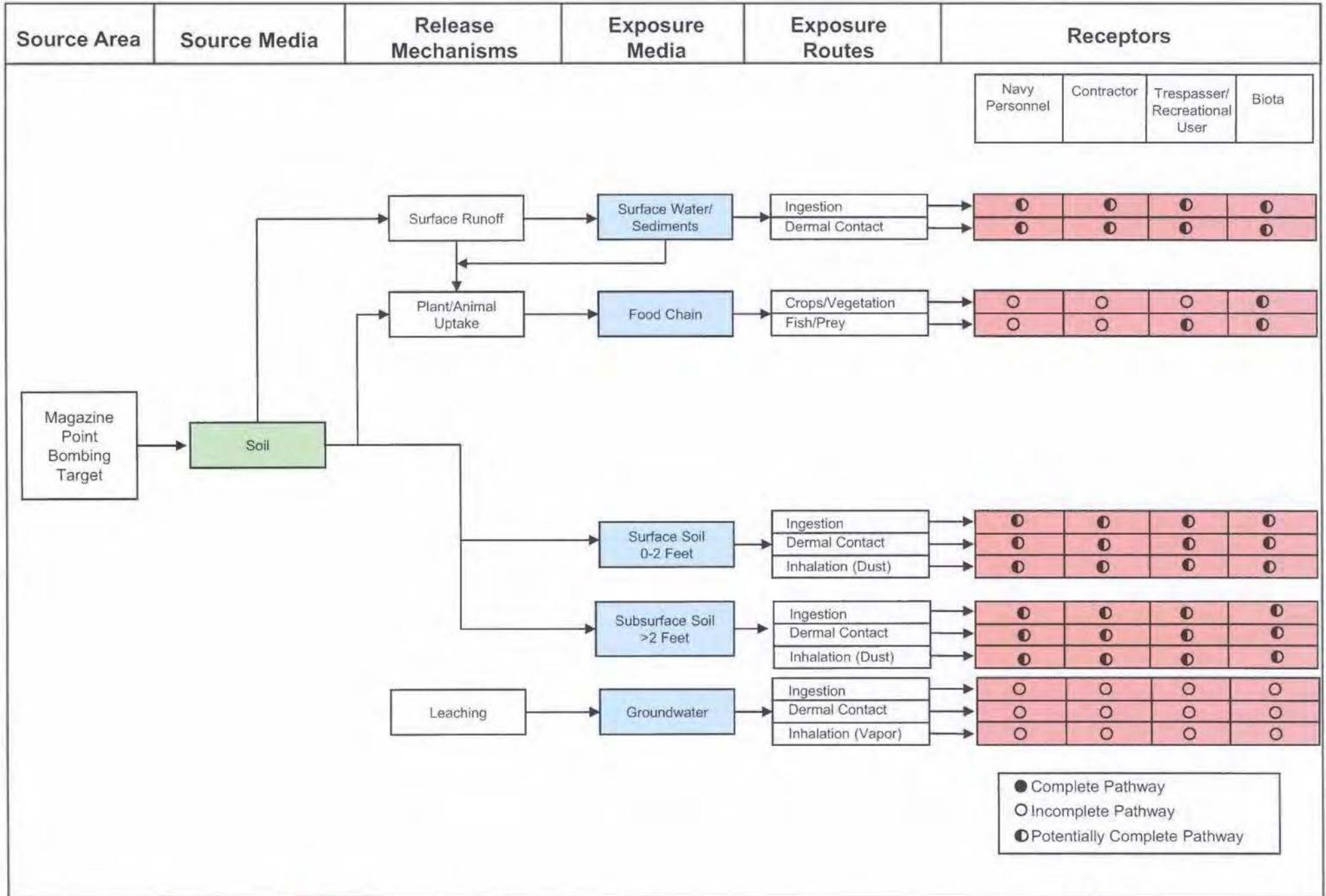
Surface Water/Sediment: MC may migrate from soil to surface water/sediment through surface water runoff that could flow directly into the Pensacola Bay. Additionally, the shallow groundwater present on the site may discharge to surface water within the area. Potential receptors include Navy personnel and contractors/visitors working in the area (i.e. maintenance and construction at the WWTP), trespassers and recreational users utilizing the bay, and aquatic and terrestrial biota that forage in the sediment and/or ingest surface water. Potentially complete exposure pathways exist for all receptors via incidental ingestion and dermal contact since the range boundary overlaps Pensacola Bay as well as the beach. MC in surface water/sediment may also bioaccumulate, and biota and recreational users may be exposed to MC through the food chain via activities like fishing.

Surface Soil (0-2 feet): MC may be present in surface soils at the range in the vicinity of the Magazine Point Bombing Target. Potential receptors include Navy personnel and contractors working in the area (i.e., maintenance and construction at the WWTP), trespassers/recreational users walking in the area, and biota that forage on the range. Potentially complete exposure pathways exist for all receptors via ingestion, inhalation, and dermal contact.

Subsurface Soil (>2 feet): MC may be present in subsurface soil at the range due to migration from the overlying surface soil via leaching mechanisms, due to the presence of buried MEC or MC-impacted surface soil, or due to disturbance from construction activities. Currently planned construction and maintenance at the WWTP could lead to exposure of contractors to MC in the subsurface soil. Some biota (e.g., foxes) may also be exposed to MC in subsurface soil while constructing burrows. Due to the inclusion of beach areas and Pensacola Bay in the site boundary, these erosive environments create the potential for MC exposure from eroded subsurface areas for Navy personnel and trespassers/recreational users. Potentially complete exposure pathways therefore exist for these receptors via incidental ingestion, dermal contact, and inhalation of dust caused by construction or soil excavation (including burrowing).

Groundwater: The depth to groundwater at Building 3644, which is southwest of the site, is approximately five to seven feet bgs. The main source of potable water for NAS Pensacola is a well field located at NTTCC Corry Station, which is to the north of Bayou Grande, so water from the site would not be used for drinking water and would not affect drinking water. The groundwater pathway is incomplete for all receptors.

Food Chain: MC in soil may be bioaccumulated by plants or animals foraging on the range. Raptors such as osprey (*Pandion haliaetus*) are known to occur on the installation. Predation of prey and/or consumption of vegetation on the range may result in bioaccumulation of MC. Potentially complete exposure pathways are identified for biota that may be exposed to MC through the food chain. Additionally, potentially complete exposure pathways exist for trespassers and recreational Pensacola Bay users who may fish in the nearby surface waters.



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MALCOLM
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Munitions Characterization
Magazine Point Bombing Target

Legend

-  Installation Boundary
 -  Range/Site Boundary
 -  Surface Danger Zone
 -  Historical Site Features
 -  Scoring Arcs
- MEC Presence***
-  Known
 -  Suspect

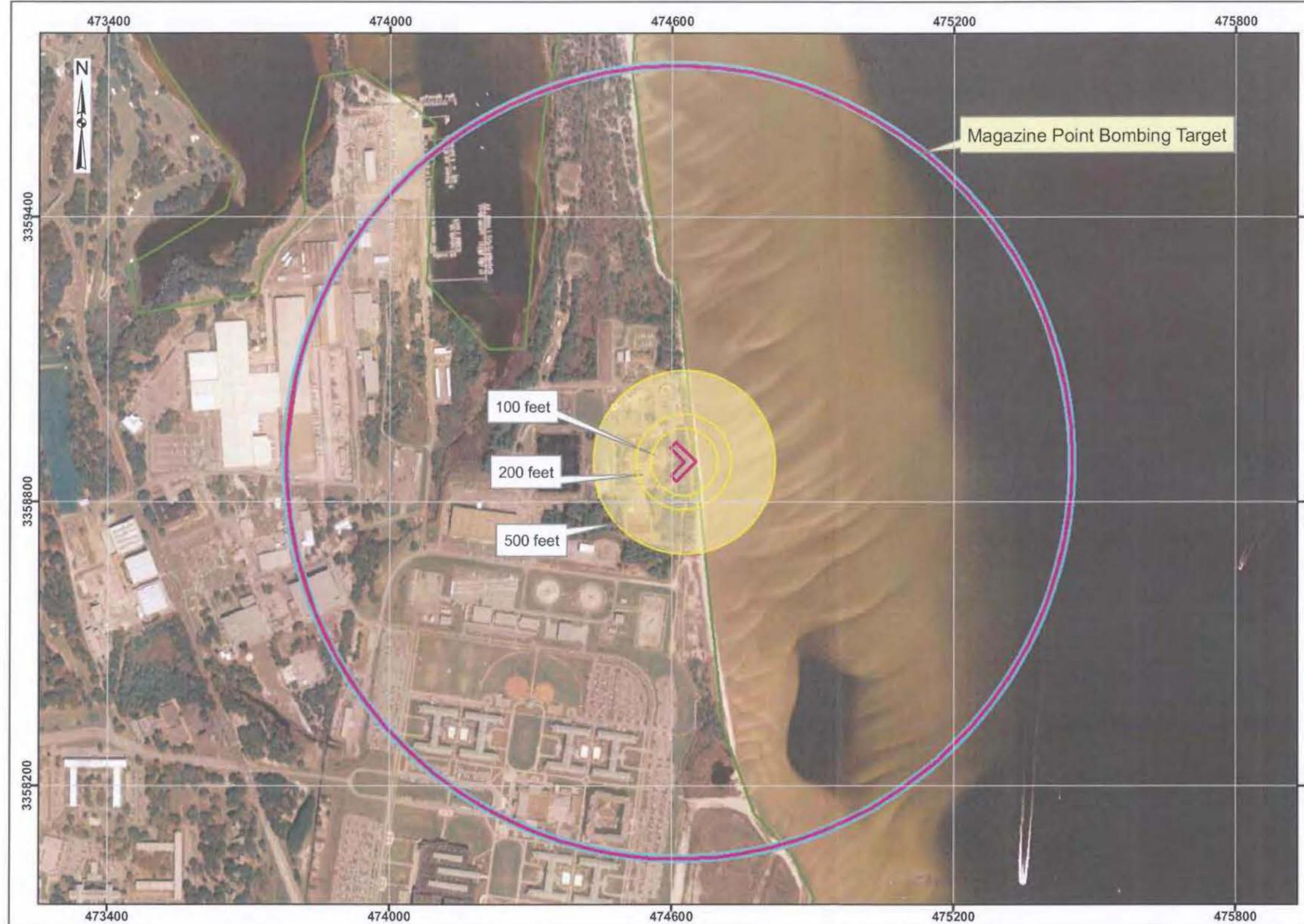
*MEC Presence was determined through review of historical documentation, interviews, and visual survey.

0 125 250 500 Meters

Data Source: NAS Pensacola, GIS Data, 2007
Map of Naval Reservation Pensacola, Florida,
Showing Conditions on June 30, 1933

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
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Date: July 2008



**Interim Conceptual Site Model Deliverable
Preliminary Assessment
Chevalier Field Pistol Range
Naval Air Station Pensacola, Florida**

Preface

This interim deliverable provides the Navy with a summary of information collected to date and the data sources used to support the Conceptual Site Model (CSM). It summarizes our current understanding of the site, presented in the attached Information Profiles. It also provides draft Graphical Presentations of the site layout and CSM. The Information Profiles and the Graphical Presentations will serve as the basis of the CSM section of the Preliminary Assessment (PA) Report.

This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. The Bayou Grande bay intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center; Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

The Chevalier Field Pistol Range was an approximately 1.18-acre range located northwest of Chevalier Field, within the boundaries of the main NAS Pensacola installation. Chevalier Field, which was activated in 1917, was the original airfield for the naval air station. The airfield was initially used for aircraft such as balloons and airships and had no paved runways. Paved runways were later added, and Chevalier Field remained the primary airstrip for the base until the 1950s, when Sherman Field was constructed. Currently, Chevalier Field is home to the Naval Air Technical Training Center (NATTC), which was relocated to NAS

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Pensacola from Tennessee in 1996. The mission of NATTC is to train Navy and Marine aviation personnel in the aeronautical technical phases of Naval Operation.



Figure 1: Aerial photograph of Chevalier Field.

Based on historical maps, the period of use for the Chevalier Field Pistol Range was approximately 1940 to 1942. No additional archival records or references to the range were located, other than historical maps. Historical maps indicated the position of the backstop berm which is typically constructed along the back side of the range approximately five feet to the rear of the targets; however, no additional information regarding firing positions, munitions use, or construction details were identified. Direction of fire was assumed to be from the southwest to the northeast based upon the orientation of the backstop berm on the historical maps and the surrounding development depicted. The boundary of the site discussed in this ICSM is based on a boundary drawn to include the backstop berm and probable firing line of the range. The Chevalier Field Pistol Range is now located beneath Building 781, which is west of Warehouse Road and north of Page Road. This entire area is developed and covered with cement parking areas and buildings.

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Figure 2: Chevalier Field Pistol Range (1940)

Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
- National Museum of Naval Aviation
- Historical Map Files, Building 458

Personal Interviews:

- Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department
- Mr. Jim Kane, Deputy Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Steve Ward, Real Property Management, NAVFAC SE Public Works Department Pensacola
- Commander Kristine Nielsen, Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Bill Taylor, NAVFAC SE Public Works Department Environmental
- Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE Public Works Department Pensacola
- Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc.
- Mr. Jeff Halstead, Exhibit Specialist, Fort Pickens State Park

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- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park
- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

A visual survey of the area around the Chevalier Field Pistol Range was conducted on 30 November 2007 during the site visit. Malcolm Pirnie team members Ms. Susan Burtnett, Ms. Cynthia Henderson, and Mr. Dan Hains were present. The purpose of the visual survey was to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), any evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site.

The area between Building 781 and the adjacent parking area was surveyed during the site visit. Approximately half of the former range, including the location of the backstop berm, is located beneath Building 781 west of Warehouse road and north of Page Road. The remainder of the site is located beneath parking areas just east of Building 781 and an adjacent fenced parking area. Storm drains were noted in the concrete parking area just east of Building 781. North of the site is a bayou flowing into Bayou Grande. East and west of the site the area is developed with warehouse type buildings. Paved parking areas lie to the west of the site. No MEC, munitions debris, or bullets/bullet fragments were observed during the visual survey.



Figure 3: View of area between Building 781 and adjacent parking lot, facing north

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Figure 4: View of area between Building 781 and adjacent parking, facing south.

Documents and Reports:

- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Ensafe, Remedial Investigation, Operable Unit 2, Naval Air Station Pensacola, October 1997
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010
- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001
- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004
- Ensafe, Remedial Investigation Addendum, Operable Unit 2, Naval Air Station Pensacola, April 2005
- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006

Websites:

- www.naspensacola.navy.mil (Installation Information)

Maps:

- Map of Naval Reservation Pensacola, Florida, Showing Conditions on June 30, 1940
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on June 30, 1942

The historical records found at the National Archives provided maps for the Chevalier Field Pistol Range. The range was shown on historical maps dated 1940 and 1942. No records pertaining to specific use or maintenance of the range were located. A Remedial Investigation (RI) completed in 1997 for Operable Unit 2 was obtained on-base and includes information about the geology, and hydrology of the area east of

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Building 781. Due to the age of the range and redevelopment of the site, interviews with Navy personnel provided no additional information about this range.

Information Profiles

Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	Chevalier Field Pistol Range
Range/Site Location	Chevalier Field Pistol Range is located west of Warehouse Road and north of Page Road within the main NAS Pensacola installation. The site is west of Pensacola Bay and north of the Gulf of Mexico.
Range/Site History	The range was shown on maps dated 1940 and 1942. No other information regarding the range history was reviewed or identified.
Range/Site Area and Layout	The Chevalier Field Pistol Range is a 1.18-acre site located north of Chevalier Field, beneath and adjacent to Building 781.
Range/Site Structures	The Chevalier Field Pistol Range site is completely developed and no range features or undeveloped areas remain. Building 781 covers a portion of the site, while parking areas cover the remaining areas. No other structures exist at the site or in the immediate vicinity.
Range/Site Boundaries	N: Buildings 781, 749, and 2666 and associated parking areas S: Buildings 455 and 821 and associated parking areas W: Building 781 E: Building 689 and associated parking and Warehouse Road
Range/Site Security	A security check point must be passed to gain access to NAS Pensacola. Access to most of the site is unrestricted from inside the installation. A small portion of the eastern side of the range is within a fenced area that may have additional access control.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	Specific ordnance types used at the range were not identified; however, typical small arms used for practice at a pistol range include .38 or .45 caliber pistols.
Maximum Probability Penetration Depth	The maximum penetration depth into the backstop berm is estimated to be 12 inches. Demolition of former ranges and site structures, along with construction and grading of former range areas, may have resulted in deposition of lead bullets and bullet fragments in the top one to two feet of soil at the site.
MEC Density	Based on historical maps, the Chevalier Field Pistol Range was only used for small arms training. MEC are not suspected to be present at the site.
Munitions Debris	No munitions debris was identified during the visual survey.
Associated Munitions Constituents	<p>The primary MC associated with small arms ammunition is lead. Other MC may include antimony, arsenic, copper, zinc and constituents associated with black and/or smokeless powder; however, these constituents are less likely to be of concern as they are either present in only minor concentrations or are typically consumed when the small arms ammunition is fired.</p> <p>Soil and groundwater sampling at the Chevalier Field Pistol Range has not been conducted; however, sampling has occurred at adjacent Installation Restoration Program (IRP) Site 12 within Operable Unit 2. Soil samples collected at IRP Site 12 contained various chemicals in excess of the regulatory limits, including: semi-volatile organic carbons (SVOCs), pesticides/polychlorinated biphenyls (PCBs), primary metals, and secondary metals. Primary metals included arsenic, barium, beryllium, cadmium, lead, nickel, and antimony. Secondary metals included aluminum, copper, iron, and manganese. The site also showed radiological impacts. Groundwater samples collected at IRP Site 12 contained pesticides/PCBs and the primary metal cadmium. Sediment samples taken from storm drains on the site contained primary metals, pesticides, polycyclic aromatic hydrocarbons, and SVOCs above regulatory limits. Most of the chemicals were traced back to former use of the site as a storage yard for scrap metal (RI, 1997).</p>

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Migration Routes/Release Mechanisms	Migration of MC from the Chevalier Field Pistol Range is unlikely since the site is covered by buildings and parking areas. Surface runoff is directed to a stormwater system, reducing the potential for contaminated surface runoff, infiltration and leaching, or plant/animal uptake. Groundwater analysis of the adjacent IRP site showed no evidence of contamination with metals associated with small arms munition constituents; therefore, leaching is not considered a migration route for this site. The only potential migration route identified for this site would be contractor maintenance of existing underground utilities in the area and subsequent contact with surface or subsurface soil via inhalation or dermal contact. Future construction, excavation, or other site work could also serve as a migration/release mechanism.

Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Climate	The climate at NAS Pensacola is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.
Topography	Chevalier Field is located within the Gulf Coastal Lowlands which are generally characterized by poor drainage and elevations less than 40 feet above mean sea level on NAS Pensacola (INRMP, 2001). The Chevalier Field Pistol Range is a relatively flat area located between two large bayous that lead to Bayou Grande.

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Geology	<p>The Chevalier Field Pistol Range is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface (bgs), and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).</p> <p>While the site-specific geology of the Chevalier Field Pistol Range has not been documented, geologic information has been documented for Operable Unit 2, which includes IRP Site 12 which is adjacent to the Chevalier Field Pistol Range. For Operable Unit 2, the surficial zone ranged from 40 to 60 feet thick. The base of the surficial zone was marine clay that appeared to be continuous over the entire site based on borings (RI, 1997).</p>
Soil	<p>Based on the U.S. Department of Agriculture Soil Survey (USDA) for Escambia County, soil within the vicinity of the range is characterized as the Arents-Urban Land Complex soil series. This soil is described by the USDA Soil Survey as soil "so modified by construction activities that the original soil components are no longer recognizable." Due to the modified nature of the soil, characteristics are not defined (USDA, 2004).</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWWMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWWMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWWMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for NAS Pensacola is a well field located at Naval Technical Training Center (NTTC) Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>No monitoring wells or groundwater information exists for the Chevalier Field Pistol Range; however, groundwater data were collected for Operable Unit 2, which includes IRP Site 12 which is adjacent to the Chevalier Field Pistol Range.. Within Operable Unit 2, the water table varied from 13 feet bgs to less than one foot bgs. The flow of groundwater was generally west to east, mimicking the topography. A general downward flow of groundwater was observed and there appeared to be no tidal influence at IRP Site 12 (RI, 1997).</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrology	<p>Bayous are located to the east and west of this site, with both bayous connecting to Bayou Grande to the north. Pensacola Bay is located approximately 2,750 feet to the east of the site. This site is located within the 100-year floodplain that occurs along the bayous (IRMP, 2001).</p> <p>This site is covered by Building 781 and adjacent parking so surface water is not in contact with soil from the site. Surface water runoff from the site flows to storm drains. Based upon Geographical Information System information from the base, the storm drains terminate at the bayou located west of the site.</p>
Vegetation	<p>Since the location of the butt identified on historical maps is currently beneath Building 781 and parking areas, no vegetation is present on site.</p>

Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	<p>The Chevalier Field Pistol Range is completely developed with various buildings and parking areas. Building 781 is a warehouse based on GIS information.</p>
Current Human Receptors	<p>Current human receptors include Navy personnel, contractors, and trespassers. Navy personnel and contractors/visitors may access the site to work or park. Trespassers may include tourists who can access public portions of NAS Pensacola.</p>
Current Activities (frequency, nature of activity)	<p>Current activities include driving and parking on the property as well as normal building repair, and maintenance. Exterior activities would include normal building and utility maintenance.</p>
Potential Future Land Use	<p>No change in land use is planned.</p>
Potential Future Human Receptors	<p>Potential future human receptors consist of the current receptors, as no change in land use is planned.</p>
Potential Future Land Use Related Activities	<p>No change in land use is planned.</p>
Zoning/Land Use Restrictions	<p>There are no known zoning/land use restrictions at the Chevalier Field Pistol Range.</p>

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Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Beneficial Resources	There are no beneficial resources located at the Chevalier Field Pistol Range.
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (U.S. Census, 2000). Approximately 14,720 civilian and military personnel are employed at NAS Pensacola (INRMP, 2001).

Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	The former range is beneath Building 781 and the adjacent parking area; therefore, no habitat type is recognized for that area.
Degree of Disturbance	Based on the lack of natural habitat on this site, this factor is not applicable.
Ecological Receptors	Since this site is located beneath Building 781, no ecological receptors are recognized for this site. Currently, there are no known threatened or endangered species on the Chevalier Field Pistol Range.
Relationship of MEC/MC Sources to Habitat and Potential Receptors	There is no likelihood of ecological receptor interaction with MC due to the site being completely developed. Additionally, the site was likely filled prior to building construction which further reduces the chance of ecological receptor interaction with MC.

Graphical Presentations

The attached Munitions Characterization Map and Exposure Pathway Analysis Figure provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Historical and visual evidence indicate that MEC are not present at the site; therefore, there are no complete exposure pathways for MEC. As such, an Exposure Pathway Analysis Figure for MEC was not created. However, information obtained and visual observations indicate that the potential for MC exists.

The Exposure Pathway Analysis figure provides a summary of complete, potentially complete, and incomplete exposure pathways for MC. For MC, interaction between the source (e.g., the berm) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to

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groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

MC Exposure and Pathway Analysis

The pathway analysis for MC is shown in Figure 5. Pathway analysis for this site led to a determination that the only potentially complete pathway for MC exposure would be for a contractor doing subsurface work; all other pathways were determined to be incomplete. Discussion is provided under each exposure medium to explain these determinations.

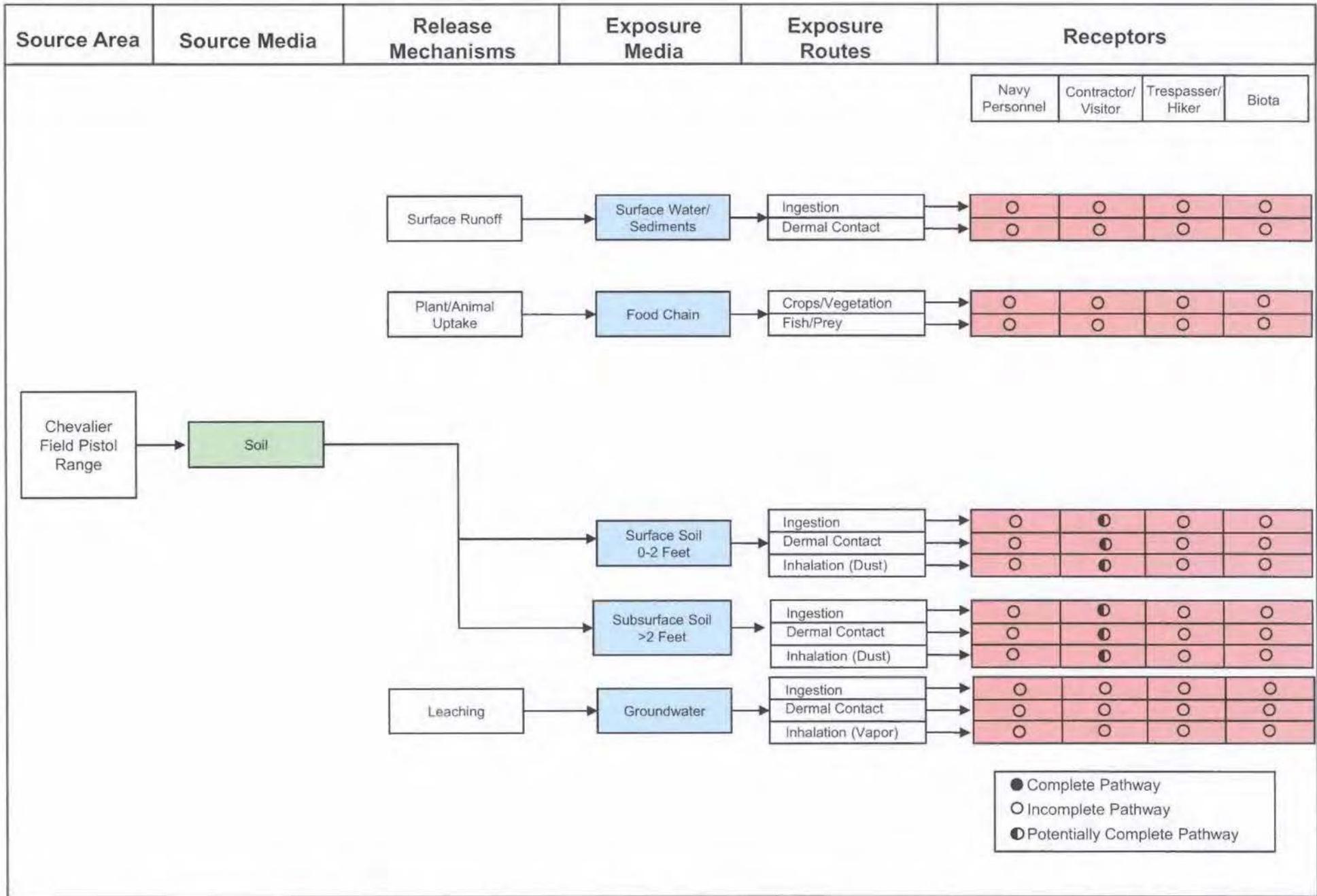
Surface Water/Sediment: Because the site is now completely developed surface water is not in contact with soil at the location of the former range preventing migration of MC from soil to surface water/sediment through surface water runoff. Therefore, surface water/sediment exposure pathways are considered incomplete for all receptors.

Surface Soil (0-2 feet): The berm for this site is no longer present but it is not known if the berm was removed or used for fill material. However, due to the development of the site, the only access to surface soil under normal conditions would be for a contractor doing intrusive work such as maintenance of underground utilities that exist in the area. Potentially complete exposure pathways exist for a contractor via ingestion, inhalation, and dermal contact with the surface soil. There are no other known current or planned intrusive activities at the range. Surface soil pathways are considered incomplete for all other receptors.

Subsurface Soil (>2 feet): MC may be present in subsurface soil at the range due to redistribution of soil during construction activities. Because of the development of the site, there is no access to subsurface soil under normal conditions except for contractors doing maintenance on existing underground utilities in the area. Potentially complete exposure pathways exist for a contractor via ingestion, inhalation, and dermal contact with the subsurface soil. There are no other current or planned intrusive activities at the range. Exposure pathways are considered incomplete for all other receptors and pathways.

Groundwater: The depth to groundwater at Operable Unit 2, which includes Chevalier Field Pistol Range, is approximately zero to 13 feet bgs. Due to the lack of MC in groundwater tested at the adjacent IRP site, groundwater is not considered a pathway for this site. Additionally, the main source of potable water for NAS Pensacola is a well field located at NTTC Corry Station, located to the north of Bayou Grande; therefore, water from the site would not be used for drinking water. Exposure pathways for all receptors and pathways are considered incomplete.

Food Chain: Due to the development of the site, there is no normal access to source media potentially containing MC and no ecological receptors present at the site. Therefore, exposure pathways for all receptors and pathways are considered incomplete.



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 Naval Air Station Pensacola, Florida



MALCOLM
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Munitions Characterization
 Chevalier Field Pistol Range

Legend

- Installation Boundary
- Range/Site Boundary
- Surface Danger Zone
- Firing Line
- Berm
- MEC Presence***
- Known
- Suspect

*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.



Data Source: NAS Pensacola, GIS Data, 2007
 Map of Naval Reservation Pensacola, Florida
 Showing Conditions on June 30, 1940

Coordinate System: UTM Zone 16N
 Datum: NAD83
 Units: meters

Contract: N62472-02-D-1300
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 Date: July 2008



**Interim Conceptual Site Model Deliverable
Preliminary Assessment
Chevalier Field Machine Gun Range
Naval Air Station Pensacola, Florida**

Preface

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This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. The Bayou Grande bay intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center; Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

The Chevalier Field Machine Gun Range is an approximately 0.2-acre range located along the northern boundary of Chevalier Field, within the boundaries of NAS Pensacola main installation. Chevalier Field, which was activated in 1917, was the original airfield for the naval air station. The airfield was initially used for aircraft such as balloons and airships and had no paved runways. Paved runways were later added, and Chevalier Field remained the primary airstrip for the base until the 1950s, when Sherman Field was

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constructed. Currently, Chevalier Field is home to the Naval Air Technical Training Center (NATTC), which was relocated to NAS Pensacola from Tennessee in 1996. The mission of NATTC is to train Navy and Marine aviation personnel in the aeronautical technical phases of Naval Operation.



Figure 1: Aerial photograph of Chevalier Field

Based on historical maps, the period of use for the Chevalier Field Machine Gun Range was approximately 1939 to 1943. No additional archival records or references to the range were located, other than historical maps. Historical maps showed the position of the backstop berm which is typically constructed along the backside of the range approximately five feet to the rear of the targets; however, no additional information regarding firing positions, munitions use, or construction details were identified. Direction of fire was assumed to be from the east to the west based upon the orientation of the backstop berm in the 1943 map and the surrounding roads depicted. The location of the probable firing line would have been approximately 50 feet east of the east side of the machine gun berm and just west of the adjacent road. The boundary of the site discussed in this ICSM is based on a boundary drawn to include the backstop berm and probable firing line of the range. The location of the range and proximity to the historic airfield indicates that this berm might have been used with aircraft-mounted machine guns for post-maintenance or repair checks. The Chevalier Field Machine Gun Range is now located beneath Building 3644, between Pat Bellinger Road and Magazine Point Road and adjacent to Millington Road. The site boundary for the Chevalier Field Machine Gun Range, which is comprised of approximately 0.2 acres, encompasses the probable firing line, target areas, and an area where a former backstop berm was located.

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Figure 2: Excerpt of map of Chevalier Field 1943

Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
- National Museum of Naval Aviation
- Historical Map Files, Building 458

Personal Interviews:

- Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department
- Mr. Jim Kane, Deputy Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Steve Ward, Real Property Management, NAVFAC SE Public Works Department Pensacola
- Commander Kristine Nielsen, Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Bill Taylor, NAVFAC SE Public Works Department Environmental
- Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE Public Works Department Pensacola
- Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc.
- Mr. Jeff Halstead, Exhibit Specialist, Fort Pickens State Park
- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park

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- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

A visual survey of the area around the Chevalier Field Machine Gun Range was conducted on 30 November 2007 during the site visit. Malcolm Pirnie team members Ms. Susan Burtnett, Ms. Cynthia Henderson, and Mr. Dan Hains were present. The purpose of the visual survey was to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), any evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site.

The Chevalier Field Machine Gun Range is currently beneath Building 3644. The area east of the former range is partially developed with buildings, and partially undeveloped with forested wetlands. The area west of the range includes undeveloped areas, as well as several buildings. South of the range is Chevalier Field, with associated buildings and parking, while north of the site are undeveloped wetland areas. The paved area around Building 3644 was surveyed from a vehicle. Additionally, the undeveloped grassed area to the west of the range was surveyed to look for any evidence of MEC or munitions debris. One item of munitions debris was located in this area, which was an expended .45 caliber cartridge case. This item is not likely to be related to the historical use of the site, since no evidence was identified that depicted this range as anything other than a machine gun range. The undeveloped area to the east of Building 3644 was observed from the car; this area was composed of a forested wetland containing downed vegetation from hurricanes and, due to the inaccessibility, that area was not walked. The site is shown on the attached map. No other MEC, munitions debris, or bullets/bullet fragments were observed during the visual survey.



Figure 3: View of Building 3644 facing east

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Figure 4: View of undeveloped area east of Building 3644

Documents and Reports:

- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Contamination Assessment Report, Site 14, Building 3644, Naval Aviation Depot, Naval Air Station, Pensacola, FL, November 1995
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010
- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001
- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004
- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006

Websites:

- www.naspensacola.navy.mil (Installation Information)

Maps:

- Map of Naval Reservation Pensacola, Florida, Showing Conditions on June 30, 1939
- Map of Chevalier Field Naval Air Station Pensacola, Florida, Showing Conditions on June 30, 1941
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on June 30, 1942
- Map of Chevalier Field Naval Air Station Pensacola, Florida, Showing Conditions on June 30, 1943

All historical records found at the National Archives for the Chevalier Field Machine Gun Range are included above. The range was shown on four maps dated 1939 through 1943. No records pertaining to specific use or maintenance of the range were located. The Contamination Assessment Report (CAR)

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completed in 1995 for Building 3644 was obtained on-base and includes information about environmental sampling, geology, and hydrology of the area east of Building 3644. Due to the age of the range and redevelopment of the site, interviews with Navy personnel provided no additional information about this range.

Information Profiles

Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	Chevalier Field Machine Gun Range
Range/Site Location	Chevalier Field Machine Gun Range is located along the northern boundary of Chevalier Field within the main NAS Pensacola installation in Escambia County, Florida. It lies south of Bayou Grande, west of Pensacola Bay, and north of the Gulf of Mexico.
Range/Site History	The range was shown on maps dated 1939 through 1943. No other information regarding the range history was reviewed or identified.
Range/Site Area and Layout	The Chevalier Field Machine Gun Range is an approximately 0.2-acre site located on the northern boundary of Chevalier Field, adjacent to Millington Road.
Range/Site Structures	Based upon historical maps, the former location of the machine gun butt is beneath Building 3644. No other structures exist at the site or in the immediate vicinity.
Range/Site Boundaries	N: Wetlands associated with a bayou flowing into Bayou Grande S: Buildings with maintained landscaping W: Buildings and some undeveloped areas E: Small Buildings, forested wetlands, and Pensacola Bay
Range/Site Security	A security check point must be passed to gain access to NAS Pensacola. Access to the site is unrestricted from inside the installation.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	Specific ordnance types used at the range were not identified; however, typical munitions used at a machine gun range include .30 and .50 caliber ammunition.
Maximum Probability Penetration Depth	The maximum penetration depth into the backstop berm is estimated to be 12 inches. Demolition of former ranges and site structures, along with construction and grading of former range areas, may have resulted in the deposition of lead bullets and bullet fragments in the top one to two feet of soil at the site.
MEC Density	Based on historical documentation, the Chevalier Field Machine Gun Range was used only for small arms training. No MEC are suspected to be present at the site.
Munitions Debris	One item of munitions debris was discovered during the site walk: a .45 caliber cartridge; however, it is unlikely that this item is related to the historical use of the site. No other evidence of munitions debris was identified during the visual survey.
Associated Munitions Constituents	<p>The primary MC associated with small arms ammunition is lead. Other MC may include antimony, arsenic, copper, zinc and constituents associated with black and/or smokeless powder; however, these constituents are less likely to be of concern as they are either present in only minor concentrations or are typically consumed when the small arms ammunition is fired.</p> <p>Groundwater sampling occurred near the Chevalier Field Machine Gun Range during a Contamination Assessment Report (CAR) prior to the removal of underground storage tanks (USTs) in 1995. Lead was present in the groundwater; however, it was detected below 50 parts per billion (ppb) for most samples. Two groundwater samples had lead concentrations of 330 ppb and 180 ppb; however, these elevated levels were attributed to high turbidity. Collection of soil samples for lead analysis was not reported in the CAR.</p>

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Migration Routes/Release Mechanisms	Migration of MC from the Chevalier Field Machine Gun Range is unlikely since the site is covered by buildings and parking areas. Surface runoff is directed to a stormwater system, reducing the potential for contaminated surface runoff, infiltration and leaching, or plant/animal uptake. The only potential migration route identified for this site would be contractor maintenance of existing underground utilities in the area and subsequent contact with surface or subsurface soil via inhalation or dermal contact. Future construction, excavation, or other site work could also serve as a migration/release mechanism.

Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Climate	The climate at NAS Pensacola is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.
Topography	Chevalier Field is located within the Gulf Coastal Lowlands, which are generally characterized by poor drainage and elevations less than 40 feet above mean sea level on NAS Pensacola (INRMP, 2001). The Chevalier Machine Gun Range area is a relatively flat area. It gently slopes to the north to a bayou flowing into Bayou Grande and to the east to Pensacola Bay.

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Geology	<p>The Chevalier Field Machine Gun Range is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface, and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).</p> <p>Soil borings taken from the eastern end of building 3644 during the 1995 CAR noted that the surficial and subsurface soil at the site is typically very fine-grained to medium-grained quartz sand.</p>
Soil	<p>Based on the U.S. Department of Agriculture (USDA) Soil Survey for Escambia County, soils within the vicinity of the range include the Corolla-Duckston soil series, which are relatively poorly-drained soils. The areas to the north and west of the site are characterized by poorly-drained muck of the Duckston soil series (USDA, 2004).</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWFMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWFMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWFMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for NAS Pensacola is a well field located at Naval Technical Training Center (NTTC) Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>Depth to groundwater at the Chevalier Field Machine Gun Range was measured at approximately five to seven feet at the east end of Building 3644 during the UST CAR in 1995. Information from monitoring wells at this location showed groundwater contamination with benzene, total volatile organic aromatics, naphthalene, and total recoverable petroleum hydrocarbons. Lead was also recorded with levels below 50 ppb with the exception of 2 samples; lead levels in those samples were attributed to turbidity.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrology	<p>Pensacola Bay is located approximately 1,590 feet east of the site. A drainage area with wetlands flowing into Bayou Grande is located just behind Building 3644 to the northwest. This site is located within the 100-year floodplain that occurs along the bayous (IRMP, 2001).</p> <p>This site is covered by Building 3644 and associated parking areas so surface water is not in contact with soil from the site. Surface water runoff from the site flows to a storm drain which terminates at a drainage ditch northwest of the site or surface water would runoff into a storm water detention area located northeast of Building 3644.</p>
Vegetation	<p>Since the location of the butt identified on historical maps is currently beneath Building 3644, no vegetation is present on site.</p>

Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	<p>Current land use of the Chevalier Field Machine Gun Range is Building 3644. According to the 1995 CAR, the facility manufactures and tests helicopter blades.</p>
Current Human Receptors	<p>Current human receptors include Navy personnel, contractors/visitors, and trespassers. Navy personnel and contractors/visitors may access the site to work or park. Trespassers may include tourists who can access public portions of NAS Pensacola.</p>
Current Activities (frequency, nature of activity)	<p>Current activities include driving and parking on the property as well as normal building repair, and maintenance. Exterior activities would include normal building, utility, and landscape.</p>
Potential Future Land Use	<p>No change in land use is planned.</p>
Potential Future Human Receptors	<p>Potential future human receptors consist of the current receptors, as no change in land use is planned.</p>
Potential Future Land Use Related Activities	<p>No change in land use is planned.</p>
Zoning/Land Use Restrictions	<p>There are no known zoning/land use restrictions at the Chevalier Field Machine Gun Range.</p>
Beneficial Resources	<p>This site is covered by Building 3644 and as a result, no beneficial resources are located on site.</p>

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Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (U.S. Census, 2000). Approximately 14,720 civilian and military personnel are employed at NAS Pensacola (INRMP, 2001).

Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	The former range is currently beneath Building 3644; therefore, no habitat type is recognized for that area.
Degree of Disturbance	Based on the lack of natural habitat on this site, this factor is not applicable.
Ecological Receptors	Since this site is located beneath Building 3644, no ecological receptors are recognized for this site. There are no known threatened or endangered species on the Chevalier Field Machine Gun Range.
Relationship of MEC/MC Sources to Habitat and Potential Receptors	There is no likelihood of ecological receptor interaction with MC due to the site being completely developed. Additionally, the site was likely filled prior to building construction, which further reduces the chance of ecological receptor interaction with MC.

Graphical Presentations

The attached Munitions Characterization Map and Exposure Pathway Analysis Figure provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Historical and visual evidence indicate that MEC are not present at the site; therefore, there are no complete exposure pathways for MEC. As such, an Exposure Pathway Analysis Figure for MEC was not created. However, information obtained and visual observations indicate that the potential for MC exists.

The Exposure Pathway Analysis figure provides a summary of complete, potentially complete, and incomplete exposure pathways for MC. For MC, interaction between the source (e.g., the berm) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

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MC Exposure and Pathway Analysis

The pathway analysis for MC is shown in Figure 5. Potential receptors include both human (Navy personnel, contractor/visitor, and trespasser) that may come in contact with MC in the source medium or other potentially contaminated media from the site. Pathways are shown for each exposure medium and are discussed below.

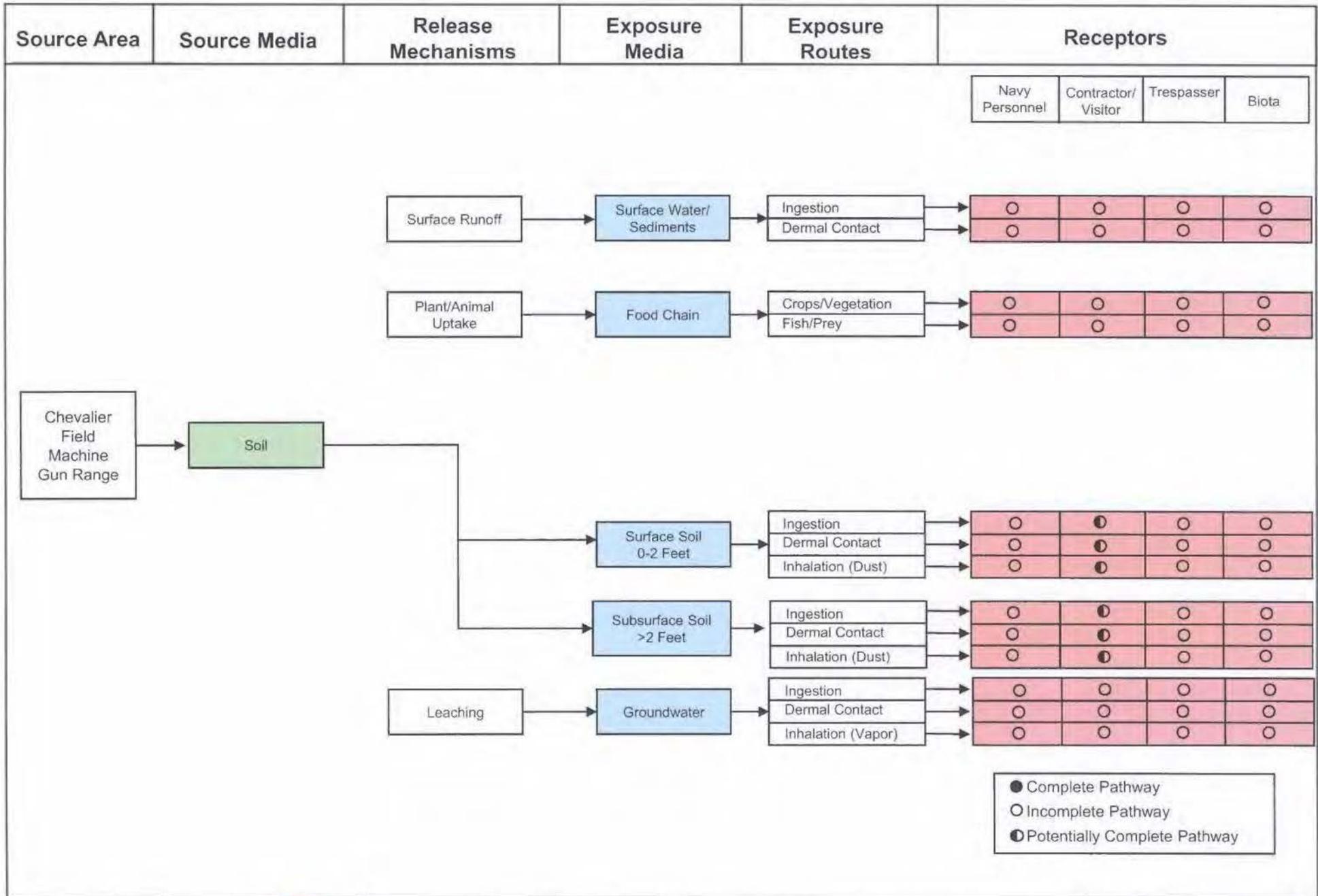
Surface Water/Sediment: Because the site is now completely developed, surface water is not in contact with soil at the location of the former range, preventing migration of MC from soil to surface water/sediment through surface water runoff. Therefore, surface water/sediment exposure pathways are considered incomplete for all receptors.

Surface Soil (0-2 feet): The berm for this site is no longer present, but it is not known if the berm was removed or used for fill material. However, due to the development of the site, the only access to surface soil under normal conditions would be for a contractor doing intrusive work such as maintenance of underground utilities that exist in the area. Potentially complete exposure pathways exist for a contractor via ingestion, inhalation, and dermal contact with the surface soil. There are no other known current or planned intrusive activities at the range. Surface soil pathways are considered incomplete for all other receptors.

Subsurface Soil (>2 feet): MC may be present in subsurface soil at the range due to redistribution of soil during construction activities. Because of the development of the site, there is no access to subsurface soil under normal conditions except for contractors doing maintenance on existing underground utilities in the area. Potentially complete exposure pathways exist for a contractor via ingestion, inhalation, and dermal contact with the subsurface soil. There are no other current or planned intrusive activities at the range. Exposure pathways are considered incomplete for all other receptors and pathways.

Groundwater: The depth to groundwater at the Chevalier Field Machine Gun Range is approximately five to seven feet bgs (CAR, 1995). However, leaching of MC into groundwater is unlikely since the building and paved parking area prevents infiltration of surface water at the site. Additionally, the main source of potable water for NAS Pensacola is a well field located at NTTC Corry Station, located to the north of Bayou Grande; therefore, water from the site would not be used for drinking water. Exposure pathways for all receptors and pathways are considered incomplete.

Food Chain: Due to the development of the site, there is no normal access to source media potentially containing MC and no ecological receptors present at the site. Therefore, exposure pathways for all receptors and pathways are considered incomplete.



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MALCOLM
 PIRNIE

Munitions Characterization
 Chevalier Field Machine Gun Range

Legend

-  Installation Boundary
-  Range/Site Boundary
-  Surface Danger Zone
-  Firing Line
-  Berm
- MEC Presence***
-  Known
-  Suspect

*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.



Data Source: NAS Pensacola, GIS Data, 2007
 Map of Naval Reservation Pensacola, Florida,
 Showing Conditions on June 30, 1939

Coordinate System: UTM Zone 16N
 Datum: NAD83
 Units: meters

Contract: N62472-02-D-1300
 Edition: Interim Conceptual Site Model
 Date: July 2008



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Fort Redoubt Skeet Range
Naval Air Station Pensacola, Florida**

Preface

This interim deliverable provides the Navy with a summary of information collected to date and the data sources used to support the Conceptual Site Model (CSM). It summarizes our current understanding of the site, presented in the attached Information Profiles. It also provides draft Graphical Presentations of the site layout and CSM. The Information Profiles and the Graphical Presentations will serve as the basis of the CSM section of the Preliminary Assessment (PA) Report.

This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. The Bayou Grande bay intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center; Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

In June of 1972, the Department of the Navy transferred a 265.45-acre excess area within NAS Pensacola to the Department of the Interior, so that it could be incorporated into the Gulf Islands National Seashore, a national park established in 1970 that encompasses gulf islands from Mississippi to Florida, along with their native historical forts. The excess area was transferred to the Department of the Interior for proper administration and protection of the associated historic resources, under the provisions of Public Law 91-

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660 of 8 January 1971. Approximately 130.45 acres of the excess area were fee owned, including a 64.4-acre tract transferred by the War Department in 1947, while the remaining 135.0 acres was public domain land. Of the fee owned excess area, 64.05 acres comprised the old Forts Redoubt, Barrancas, and San Carlos, with the remaining 66.4 acres comprising the Fort Pickens Rifle Range, located on Santa Rosa Island, which was transferred from the United States Army in 1948. The 135.0-acre excess of undeveloped public domain land was originally withdrawn for Navy use by Public Land Order 1603 of 18 March 1958, and was known as Fort McRee, located on Perdido Key. Due to the provisions of Public Law 91-660, the excess areas were never screened.

Little is known about Fort Redoubt, also known as Advanced Redoubt. As mentioned earlier, the fort is currently part of the Gulf Island National Seashore, and is managed by the National Park Service (NPS). According to the NPS, Fort Redoubt was built sometime between 1845 and 1870 as part of a defensive network within Fort Barrancas for the U.S. Navy Yard and Station. Fort Pickens, Fort Barrancas, and Fort McRee were built to protect the entrance to the harbor, while Fort Redoubt was built to defend the northern side of the peninsula, where the U.S. Navy Yard and Station was located, from any land-based assaults.



Figure 1: Aerial photograph of Fort Redoubt.

The Fort Redoubt Skeet Range, also denoted as Gunnery Range and Army Range, is located approximately 300 feet to the southwest of the walls of Fort Redoubt. The total acreage within the range/site boundary designated for the Fort Redoubt Skeet Range is approximately 29.2 acres, and includes the Skeet Range boundary, as well as its Surface Danger Zone (see attached ICSM site map). The range is denoted on maps dated 1930, 1949, 1950, 1951, 1952, and 1954. Based upon information obtained from the map dated 1950, the Skeet Range appears to have been a single field range. One structure (Building 1712) is denoted on maps dated 1949, 1950, 1951, 1952, and 1954. Two features that

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appear to be a berm and a ditch appear on maps dated 1930, 1949, 1950, 1951, 1952, and 1954; however, no document was identified that explained the use or affiliation of these features. Approximately 30 percent of the area comprising the Surface Danger Zone for the Skeet Range falls on land that was transferred to the Department of the Interior (managed by the NPS) in 1947. No additional information regarding munitions use associated with this range was obtained during the archival data search or site survey activities.

This ICSM addresses the area within the range/site boundary (approximately 47.6 acres),

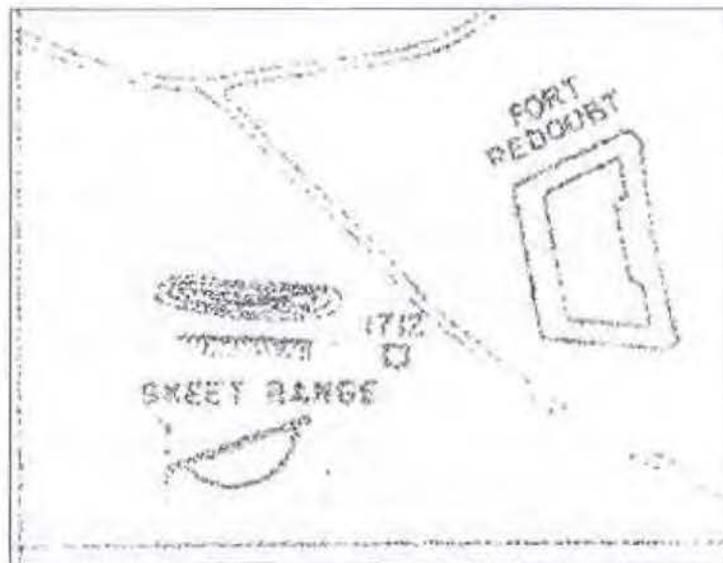


Figure 2: Single field layout, Building 1712, and berm and ditch features for Skeet Range, as denoted on map dated 1950.

Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
- National Museum of Naval Aviation
- Historical Map Files, Building 458

Personal Interviews:

- Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department

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- Mr. Jim Kane, Deputy Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Steve Ward, Real Property Management, NAVFAC SE Public Works Department Pensacola
- Commander Kristine Nielsen, Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Bill Taylor, NAVFAC SE Public Works Department Environmental
- Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE Public Works Department Pensacola
- Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc.
- Mr. Jeff Halstead, Exhibit Specialist, Fort Pickens State Park
- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park
- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

A visual survey of the Fort Redoubt Skeet Range was conducted on 29 November 2007 during the site visit. Malcolm Pirnie team members Ms. Susan Burnett, Ms. Daria Navon, Ms. Angela Nolan, and Mr. Dan Hains were present. The purpose of the visual survey was to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site.

The visual survey consisted of walking the perimeter of the former range to determine the presence/absence of MEC and MC along the periphery of the site. The Fort Redoubt Skeet Range lies within a thickly vegetated and wooded area east of a concrete and demolition waste disposal area. The western portion of the range lies beneath large piles of concrete debris, and the remainder of the range is thickly vegetated with little accessibility. No MEC, munitions debris, or bullets/bullet fragments were observed in the accessible portions of the range during the visual survey. No berm, ditch, or signs of former range structures exist at the site or in the immediate vicinity. A sign denoting NPS property boundaries was observed on the ground in the wooded portion of the site; however, the original location of the sign could not be determined.

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Figure 3: View of concrete debris in the western boundary of range.



Figure 4: View of vegetation on former range.

Documents and Reports:

- Correspondence between the Bureau of Yards and Docks and the General Services Administrator in Washington, DC regarding the transfer of old Forts Barrancas, San Carlos, and Redoubt to the United States Department of the Interior for retransfer to the State of Florida, 18 July 1950
- Disposal Report No. 366 submitted by Commander, Naval Facilities Engineering Command discussing the excess and disposal of 265.45 acres of land to the Department of the Interior for future incorporation into the Gulf Islands National Seashore, 30 June 1972

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- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010
- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001
- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004
- Final Integrated Cultural Resources Management Plan, NAS Pensacola, Escambia County, Volume 1, February 2004
- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006
- Final Preliminary Assessment, Naval Air Station Pensacola, Florida, August 2007

Websites:

- <http://www.naspensacola.navy.mil> (Installation Information)
- <http://www.nps.gov> (Installation/Regional Information)
- <http://www.usgs.gov> (Regional Information)
- <http://ns.gov.gu> (Regional Information)
- <http://geocities.com> (Regional/Demographics Information)
- <http://census.gov> (Demographics Information)
- <http://fws.gov> (Threatened and Endangered Species Information)

Maps:

- Fort Barrancas Quadrangle Map, 1905
- Map of the Military Reservation at Fort Barrancas, Florida, 1909
- U.S. Naval Air Station, Pensacola, Florida, Development Plan, 3 March 1930
- Office of Post Engineer, Fort Barrancas, Florida, August 1943
- Fort Barrancas Quadrangle Map, 1944
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on June 30, 1949
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on June 30, 1950
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on June 30, 1951
- U.S. Naval Air Station, Pensacola, Florida, Demolition and Removal of Buildings, 1952
- U.S. Naval Air Station, Pensacola, Florida, Painting of Ten Buildings, #8, 603, 646, 679, 710, 742, 1559, 1560, 380 & 382, 1 June 1954
- General Development Plan, U.S. Naval Air Station, Pensacola, Florida, 1957
- Fort Barrancas Quadrangle Map, 1987
- Fort Barrancas Quadrangle Map, 1992
- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Real Estate Summary Map, Naval Air Station Pensacola, 13 May 2002

Historical maps dated 1930, 1949, 1950, 1951, 1952, and 1954, found at the National Archives, provided information regarding the location and layout of the Fort Redoubt Skeet Range; however, no records were

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located within the archives that contained the general history of Fort Redoubt and its use, nor munitions use at the Skeet Range.

Information Profiles

Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	Fort Redoubt Skeet Range
Range/Site Location	Fort Redoubt is located within NAS Pensacola in Escambia County, Florida. It lies approximately 0.4 miles south of Bayou Grande, 2.1 miles west of Pensacola Bay, and 0.7 miles north of the Gulf of Mexico.
Range/Site History	The range was shown on maps dated 1930, 1949, 1950, 1951, 1952, and 1954. No other information regarding the range history was identified.
Range/Site Area and Layout	The Skeet Range is a 29.2-acre site located approximately 300 feet to the southwest of Fort Redoubt.
Range/Site Structures	No structures exist at the site or in the immediate vicinity.
Range/Site Boundaries	N: Wooded area S: Wooded area W: Wooded area, concrete and demolition waste debris E: Wooded area, Fort Redoubt
Range/Site Security	A security check point must be passed to gain access to NAS Pensacola. A fence surrounds portions of the range boundary; however, access to the site is not directly restricted. Signs denote the NPS portions of the site.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	Specific ordnance types used at the range were not documented; however, typical small arms used for practice at skeet ranges include 12-gauge shotguns.
Maximum Probability Penetration Depth	Pellets dispersed from a shotgun used at the Fort Redoubt Skeet Range would be deposited on the ground surface and would not penetrate the ground surface unless disturbed.
MEC Density	No historical documentation involving ammunition used at the range was found; however, since historical maps depict the site as a skeet range, MEC are not suspected to be present at the site.
Munitions Debris	No evidence of munitions debris was identified during the visual survey.
Associated Munitions Constituents	<p>The primary MC associated with small arms ammunition is lead. Other MC may include antimony, arsenic, copper, zinc and constituents associated with black and/or smokeless powder; however, these constituents are less likely to be of concern as they are either present in only minor concentrations or are typically consumed when the small arms ammunition is fired.</p> <p>Clay pigeons were likely used as targets at the Skeet Range. Clay targets are typically bound together with petroleum products that contain polycyclic aromatic hydrocarbons (PAHs). Although PAHs are an associated MC, they tend to be tightly bound in the petroleum pitch and limestone matrix of the target and are therefore not readily available to the environment.</p> <p>No sampling regarding MC has been conducted at the site.</p>
Migration Routes/Release Mechanisms	Migration of MC from the Fort Redoubt Skeet Range may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake. Future disposal of construction debris could also serve as a migration/release mechanism.

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Climate	<p>The climate at Fort Redoubt is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.</p>
Topography	<p>Fort Redoubt resides in the Coastal Lowland topographic division of the Coastal Plain physiographic division of the U.S. The Coastal Lowlands consist of relatively undissected, nearly level plains that lie less than 100 feet above mean sea level (msl). The Skeet Range is located in a relatively flat area surrounded by dense woods.</p>
Geology	<p>The Skeet Range is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface (bgs), and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).</p>

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Conceptual Site Model Information Profiles - Physical Profile	
Information Needs	Preliminary Information
Soil	According to the Soil Survey for Escambia County, soils at the Fort Redoubt Skeet Range are classified as the Kureb Sand, which are very deep, excessively drained, sandy soils with high permeability that are typically found in undulating low ridges, knolls, and old dunes within the coastal lowlands (USDA, 2004). Soils surrounding the Skeet Range are the Pickney-Croatan Soils, which are very deep, poorly-drained soils that are sandy throughout with intermittent organic material (USDA, 2004). Permeability for the Pickney-Croatan Soils is moderate.

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWFMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWFMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWFMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for NAS Pensacola is a well field located at Naval Technical Training Center Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>Depth to groundwater at the Fort Redoubt Skeet Range is approximately two to three feet bgs. No nearby monitoring wells or groundwater information were identified for the Skeet Range.</p>
Hydrology	<p>The Fort Redoubt Skeet Range lies approximately 0.4 miles south of Bayou Grande, 2.1 miles west of Pensacola Bay, and 0.7 miles north of the Gulf of Mexico. The range consists of generally flat terrain with surface drainage flowing north into Bayou Grande. There are no known major surface water consumptive uses within the area.</p>
Vegetation	<p>The Skeet Range lies within a thickly vegetated and wooded area.</p>

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Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	The Skeet Range is currently closed, and the portion of the site that is part of NAS Pensacola has no currently designated or future planned land use, other than unofficial disposal area for construction debris. The portion of the site that is managed by the NPS is designated as a National Park (i.e., the Gulf Islands National Seashore).
Current Human Receptors	Current human receptors include Navy personnel/contractors, trespassers, and visitors. Navy personnel/contractors may access the site to dispose of construction debris and trespassers (i.e., hikers or naturalists) or visitors may access the site from Fort Redoubt, which is part of the Gulf Islands National Seashore.
Current Activities (frequency, nature of activity)	Current activities include visitation and routine grounds-keeping at the National Park. Infrequent activities, such as construction debris disposal, are expected for Navy personnel/contractors.
Potential Future Land Use	No change in land use is planned.
Potential Future Human Receptors	Potential future human receptors are expected to be the same as potential current receptors, as no change in land use is anticipated.
Potential Future Land Use Related Activities	Potential future land use related activities include maintenance activities associated with the National Park.
Zoning/Land Use Restrictions	There are no zoning/land use restrictions at the NAS Pensacola-owned portion of the Fort Redoubt Skeet Range. The remaining portion of the former range is part of a National Park.
Beneficial Resources	Cultural and natural resources associated with Fort Redoubt and the National Park Service are beneficial resources; however, no beneficial resources have been identified for the portion of the Fort Redoubt Skeet Range that is located within the installation.
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (2000 Census). Approximately 14,720 civilian and military personnel are employed at NAS Pensacola (INRMP, 2001).

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Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	No documentation was identified describing the habitat type of the Fort Redoubt Skeet Range. The Skeet Range is mostly covered by mature trees, thick underbrush, and small shrubs.
Degree of Disturbance	The current and future land uses of the Skeet Range within the installation result in a low degree of disturbance to the habitat or ecological receptors. Landscaping and lawn-maintenance conducted within the NPS portion of the Skeet Range result in a moderate degree of disturbance to the habitat and ecological receptors.
Ecological Receptors	Terrestrial ecological receptors may include mammals (e.g., foxes, bears, and squirrels), reptiles (e.g., tortoises), terrestrial plants, and a variety of bird species. Aquatic ecological receptors in nearby surface water may include various species of fish, amphibians, and aquatic/wetland vegetation. Currently, threatened or endangered species possibly inhabiting the Fort Redoubt Skeet Range include the Eastern indigo snake (<i>Drymarchon coureais couperi</i>), Arctic peregrine falcon (<i>Falco peregrinus tundrius</i>), southeastern kestrel (<i>Falco sparverius paulus</i>), bald eagle (<i>Haliaeetus leucocephalus</i>), wood stork (<i>Mycteria americana</i>), and the Florida black bear (<i>Ursus americanus floridanus</i>).
Relationship of MEC/MC Sources to Habitat and Potential Receptors	Flora may bioaccumulate MC in surface and/or subsurface soil, via plant uptake. Fauna may be exposed to MC in surface soil through ingestion, dermal contact, and inhalation or by ingesting vegetation or prey organisms that may bioaccumulate MC.

Graphical Presentations

The attached Munitions Characterization Map and Exposure Pathway Analysis Figure provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Historical and visual evidence indicate that MEC are not present at the site; therefore, there are no complete exposure pathways for MEC. As such, an Exposure Pathway Analysis Figure for MEC was not created. However, information obtained and visual observations indicate that the potential for MC exists.

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The Exposure Pathway Analysis figure provides a summary of complete, potentially complete, and incomplete exposure pathways for MC. For MC, interaction between the source (e.g., lead shot on surface soil) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

MC Exposure and Pathway Analysis

The pathway analysis for MC is shown in Figure 5. Potential receptors include both human (Navy personnel/contractor, visitor, and trespasser) and ecological (biota) receptors that may come in contact with MC in the source medium or other potentially contaminated media from the site. Pathways are shown for each exposure medium and are discussed below.

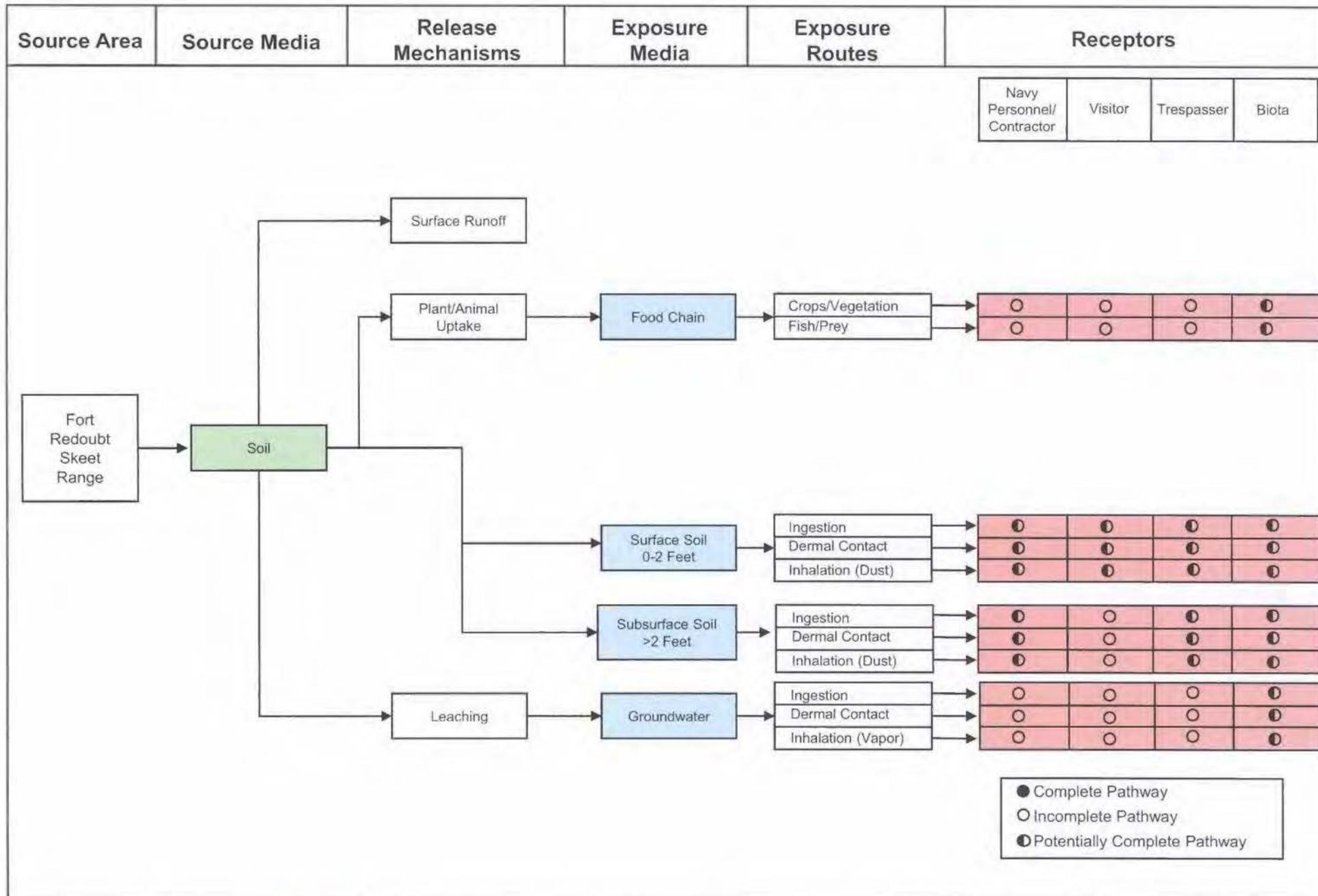
Surface Water/Sediment: MC may migrate from soil to surface water/sediment through surface water runoff. No surface water bodies exist at the site; therefore, there are no complete or potentially complete exposure pathways for any receptors.

Surface Soil (0-2 feet): MC may be present in the surface soil from shot fall within the range/site boundary and from clay pigeons used as targets at the range. Potential receptors include Navy personnel/contractors disposing construction debris, trespassers, visitors of the National Park, and biota that construct burrows or forage on the range. Potentially complete exposure pathways exist for these receptors via incidental ingestion, dermal contact, and inhalation.

Subsurface Soil (>2 feet): MC may be present in subsurface soil at the range due to migration from the overlying surface soil via leaching mechanisms and/or disturbance of surface soil during site activities. Due to the construction debris disposal activities and the topographic nature of the site, the subsurface is exposed in many areas of the former range currently owned by NAS Pensacola; therefore, Navy personnel/contractors and trespassers may be exposed to MC in the subsurface soil. Some biota may also be exposed to MC in subsurface soil while constructing burrows. Potentially complete exposure pathways therefore exist for the human receptors via incidental ingestion and dermal contact due to the current state of the site, and inhalation of dust caused by future disposal activities at the site. Potentially complete exposure pathways also exist for biota via inhalation, dermal contact, and incidental ingestion during burrowing.

Groundwater: Depth to groundwater at the Fort Redoubt Skeet Range is approximately two to three feet bgs. Due to the shallow nature of groundwater at the site and the consequent ease of exposure, groundwater exposure pathways are considered to be potentially complete for biota during burrowing.

Food Chain: MC in soil may accumulate in plants, which can subsequently be consumed by animals foraging on the site. Predation of prey and/or consumption of vegetation may result in bioaccumulation of MC. Potentially complete exposure pathways therefore exist for biota that may be exposed to MC through the food chain.



● Complete Pathway
 ○ Incomplete Pathway
 ◐ Potentially Complete Pathway



PRELIMINARY ASSESSMENT – INTERIM CONCEPTUAL SITE MODEL
 FORT REDOUBT SKEET RANGE – MC EXPOSURE PATHWAY ANALYSIS
 NAVAL AIR STATION PENSACOLA, FLORIDA

MALCOLM PIRNIE, INC.

FIGURE 5
 August 2008

Interim Conceptual Site Model
Naval Air Station Pensacola, Florida



MALCOLM
PIRNIE

Munitions Characterization
Fort Redoubt Skeet Range

Legend

- Installation Boundary
 - Range/Site Boundary
 - Surface Danger Zone
 - Historical Site Features
 - Firing Line
 - Berm
 - National Park Service Boundaries
- MEC Presence***
- Known
 - Suspect

*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.



Data Source: NAS Pensacola, GIS Data, 2007
Map of Naval Reservation, Pensacola, FL,
Showing Conditions on June 30, 1950

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
Edition: Interim Conceptual Site Model
Date: July 2008



**Interim Conceptual Site Model Deliverable
Preliminary Assessment
Magazine Point Rifle Range
Naval Air Station Pensacola, Florida**

Preface

This interim deliverable provides the Navy with a summary of information collected to date and the data sources used to support the Conceptual Site Model (CSM). It summarizes our current understanding of the site, presented in the attached Information Profiles. It also provides draft Graphical Presentations of the site layout and CSM. The Information Profiles and the Graphical Presentations will serve as the basis of the CSM section of the Preliminary Assessment (PA) Report.

This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. The Bayou Grande bay intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center (NATTC); Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

Magazine Point is a peninsula within NAS Pensacola that is approximately four miles southwest of Pensacola, Florida, and is directly north of Chevalier Field. The area just south of the peninsula was initially the U.S. Navy Yard and Station, which according to historical records, was established in 1824 after the purchase of Florida from Spain (Young, 1910-1911). The U.S. Navy Yard and Station was used as a base for repairs and supplies to the American fleet engaged in the suppression of the slave trade and the

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final annihilation of the formidable buccaneers and piracy in the Gulf of Mexico, the Caribbean Sea, and adjacent waters (Young, 1910-1911). Woolsey, one of two villages that were initially established to provide housing for mechanics and skilled laborers brought down from the North to work at the U.S. Navy Yard and Station, was located just north of the U.S. Navy Yard and Station, at the base of the Magazine Point peninsula. These villages developed into successful communities, housing some of the most social, cultivated, and exclusive families of Florida. Magazine Point later became part of NAS Pensacola, with the area just south of the peninsula becoming Chevalier Field in 1917, following the closing of the U.S. Navy Yard and Station in 1911. Chevalier Field is the original airfield for NAS Pensacola, which remained the naval air station's primary airfield until the 1950s. Currently, Chevalier Field is home to the NATTC, which was relocated to this site from Tennessee in 1996. The mission of the NATTC is to train Navy and Marine aviation personnel in the aeronautical technical phases of Naval Operation.



Figure 1: Aerial photograph of Magazine Point peninsula.

The Magazine Point Rifle Range is an 8.6-acre site located on the Magazine Point peninsula that was used for small arms target practice during the early 1900s. The range was positioned along the shoreline of Pensacola Bay, approximately 4.8 miles southwest of Pensacola, Florida and about 0.3 miles north of Chevalier Field. According to historical maps, the Rifle Range was constructed directly to the north of Woolsey and the former U.S. Navy Yard and Station. The Rifle Range was a 1000-yard range, with firing points at 200, 300, 500, 600, and 1000 yards. Firing was directed towards the north and into a backstop berm. The total acreage of the range/site boundary for the Magazine Point Rifle Range (i.e., 8.57 acres), as depicted in the ICSM site map, includes only the range and associated range features and does not include the Surface Danger Zone. The Rifle Range was partially destroyed during a hurricane in 1906 (Young, 1910-1911). The historical archives search produced correspondence from 1910 that discussed proposed repairs and modifications to the Rifle Range after its partial destruction. In addition, a map dated 1910 shows the proposed repairs and modifications to the range, as mentioned in the 1910 correspondence; however, no other archives were identified that denoted the range or its modification after

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1910. The Magazine Point Rifle Range is denoted on the map dated 1910 and on an undated map, and is mentioned in a historical document dated 1910-1911, as well as in correspondence from 1910. The Rifle Range does not appear on maps dated 1844, 1874, 1882, 1909, and 1928. No additional information regarding munitions use associated with this range was obtained during the archival data search.

This ICSM addresses the area within the range/site boundary (approximately 8.6 acres) and does not include the range's Surface Danger Zone.

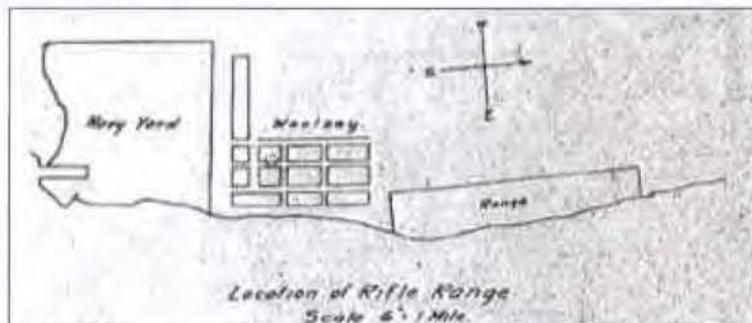


Figure 2: Rifle Range as depicted on map dated 1910.

Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
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Personal Interviews:

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Magazine Point Rifle Range
Naval Air Station Pensacola, Florida**

- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park
- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

Two visual surveys of the area around the Magazine Point Rifle Range were conducted: the first occurred on 30 November 2007 and the second occurred on 2 April 2008. Malcolm Pirnie team members Ms. Susan Burnett, Ms. Cindy Henderson, and Mr. Dan Hains were present for the 30 November 2007 visit, and Malcolm Pirnie team members Ms. Angela Nolan and Mr. Dan Hains were present for the 2 April 2008 visit. The purpose of the visual surveys were to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site.

The Magazine Point Rifle Range was located just north of Chevalier Field, along Pensacola Bay. The northern and central portions of the former range are undeveloped and unmaintained areas, except for structures associated with a wastewater treatment facility. The southern portion of the range currently contains an aviation maintenance and repair facility, with a recreational park in the southernmost portion of the range. The area from the Pensacola Bay shoreline up to the heavily vegetated area adjacent to the wastewater treatment facility fence line was visually surveyed. Much of the shoreline area to the east of the Rifle Range was covered with storm debris, as well as concrete and asphalt debris from an unknown source. The heavily vegetated area within the former range boundary included dense growth of pines, vines, and various shrubs. Due to inaccessibility, the heavily vegetated area and the area inside the wastewater treatment facility were not surveyed. A large mound of dirt was observed just southeast of the Magazine Point Rifle Range; however, the history and use of the mound is unknown. No MEC, munitions debris, or bullets/bullet fragments were observed during the visual surveys. No structures exist at the site or in the immediate vicinity.

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Figure 3: Looking west from Rifle Range towards wastewater treatment facility.



Figure 4: View of undeveloped central portion of Rifle Range.

Documents and Reports:

- Memorandum from Rear Admiral Lucien Young, USN Commandant of the United States Navy Yard and Station to Rear Admiral R.C. Hollyday, USN, Chief of the Bureau of Yards and Docks discussing repairs to a rifle range, 19 August 1910

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- Memorandum from Rear Admiral Lucien Young, USN Commandant of the United States Navy Yard and Station to Wm. M. Smith, Chief Clerk, Bureau of Yards and Docks discussing repairs to a rifle range, 2 September 1910
- A Brief History of the United States Navy Yard and Station, Pensacola, Florida and Its Possibilities, Rear Admiral Lucien Young, USN Commandant, 1910-1911
- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Contamination Assessment Report, Site 14, Building 3644, Naval Aviation Depot, Naval Air Station, Pensacola, FL, November 1995
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010
- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001
- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004
- Final Integrated Cultural Resources Management Plan, NAS Pensacola, Escambia County, Volume 1, February 2004
- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006
- Final Preliminary Assessment, Naval Air Station Pensacola, Florida, August 2007

Websites:

- <http://www.naspensacola.navy.mil> (Installation Information)
- <http://www.nps.gov> (Regional Information)
- <http://www.usgs.gov> (Regional Information)
- <http://ns.gov.gu> (Regional Information)
- <http://geocities.com> (Regional/Demographics Information)
- <http://census.gov> (Demographics Information)
- <http://fws.gov> (Threatened and Endangered Species Information)

Maps:

- Plan Showing the Permanent Improvements in the Navy Yard Near Pensacola and the Adjacent Improvements, January 1844
- Plan of U.S. Navy Yard, Pensacola, Florida Showing Present Improvements, June 1874
- U.S. Navy Yard, Pensacola, Showing Plan of Permanent Wharf, 1882
- Map of the Military Reservation at Fort Barrancas, Florida, 1909
- U.S. Navy Yard, Pensacola, Florida Rifle Range, 1910
- U.S. Naval Air Station, Pensacola, Florida, Temporary Black Powder Magazine 10,000-lb. Capacity Sketch Plan, 1928
- Plan Proposed for U.S. Naval Reservation, Pensacola, Florida, undated

The historical records found at the National Archives provided information regarding the Magazine Point Rifle Range. The Rifle Range was shown on a map dated 1910 and on an undated map, and is mentioned in a historical document dated 1910-1911, as well as in correspondence from 1910. A Contamination

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Assessment Report completed in November of 1995 for Building 3644, located to the south of the Rifle Range within Chevalier Field, was obtained during the site visit and includes information about sampling, geology, and hydrology in the general area. With the exception of the above mentioned documents, the location and layout of the Rifle Range, previous sampling data, and potential migration pathway analyses were not identified or discussed in any other documents.

Information Profiles

Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	Magazine Point Rifle Range
Range/Site Location	The Magazine Point Rifle Range is an 8.6-acre site located on the west side of Pensacola Bay, approximately 4.8 miles southwest of Pensacola, Florida and about 0.3 miles north of Chevalier Field.
Range/Site History	The Magazine Point Rifle Range is denoted on a map dated 1910 and on an undated map, and is mentioned in a historical document dated 1910-1911, as well as in correspondence from 1910. No other information regarding the range history was located.
Range/Site Area and Layout	The Rifle Range is located along the shoreline of Pensacola Bay. Much of the former range is undeveloped, aside from structures associated with the wastewater treatment facility within the northern boundary of the site and the aviation maintenance and repair facility within the southern boundary.
Range/Site Structures	Five shelters, one range house, and one butt (backstop berm) were denoted on the historical map dated 1910; however, no evidence of these structures was observed during the visual site surveys conducted in November 2007 and April 2008.
Range/Site Boundaries	N: Vegetated undeveloped area, Pensacola Bay S: Chevalier Field airfield, recreational park, classrooms W: Wastewater treatment facility, aviation maintenance and repair E: Vegetated undeveloped area, storm and concrete debris, Pensacola Bay

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Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Range/Site Security	A security check point must be passed to gain access to NAS Pensacola. A fence exists on portions of the former range that lie within the wastewater treatment facility. All other portions have no direct restriction and can be accessed from Pensacola Bay or from Chevalier Field.

Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	Specific ordnance types used at the range were not documented; however, typical small arms used for practice at rifle ranges are .30 caliber rounds.
Maximum Probability Penetration Depth	Maximum penetration depth for the backstop berm at the Rifle Range was approximately 12 inches.
MEC Density	Based on historical documentation, the Magazine Point Rifle Range was used only for small arms training. MEC are not suspected to be present at the sites.
Munitions Debris	No evidence of munitions debris was identified during the visual surveys in the vicinity of the Rifle Range.
Associated Munitions Constituents	The primary MC associated with small arms ammunition is lead. Other MC may include antimony, arsenic, copper, zinc and constituents associated with black and/or smokeless powder; however, these constituents are less likely to be of concern as they are either present in only minor concentrations or are typically consumed when the small arms ammunition is fired. Soil sampling at the Magazine Point Rifle Range has not been conducted.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Migration Routes/Release Mechanisms	Migration of MC from the Magazine Point Rifle Range may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake.

Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Climate	The climate at Magazine Point is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.
Topography	Magazine Point resides in the Coastal Lowland topographic division of the Coastal Plain physiographic division of the U.S. The Coastal Lowlands consist of relatively undissected, nearly level plains that lie less than 100 feet above mean sea level (msl) (INRMP, 2001). The Rifle Range is located in a relatively flat area surrounded by dense woods and the Pensacola Bay shoreline.

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Geology	<p>The Magazine Point Rifle Range is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface (bgs), and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).</p>
Soil	<p>Based upon the Soil Survey for Escambia County, soils within the vicinity of the Rifle Range include the Corolla-Duckston Sands, which are very deep, somewhat poorly drained sandy soils (USDA, 2004). To the east of the former range are beach sediments that are tide-washed sands with high permeability (USDA, 2004).</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWWMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWWMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWWMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for NAS Pensacola is a well field located at Naval Technical Training Center Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>Depth to groundwater at Building 3644 was measured at approximately five to seven feet bgs (CAR, 1995). Information from monitoring wells installed during the 1995 investigation showed elevated levels of benzene, total volatile organic aromatics, naphthalene, and total recoverable petroleum hydrocarbons, probably associated with an underground storage tank located at the site (CAR, 1995).</p>

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Conceptual Site Model Information Profiles - Physical Profile	
Information Needs	Preliminary Information
Hydrology	Magazine Point consists of generally flat terrain with surface drainage flowing towards Pensacola Bay, which lies directly to the east of the Rifle Range. There are no known major surface water consumptive uses within the area.
Vegetation	Dense areas of oaks and pines with small shrubs and vines are present in the central and northern portions of the former range.

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Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	The northern portion of the Rifle Range is part of the wastewater treatment facility. The southern portion of the range is part of an aviation maintenance and repair facility, with a recreational park in the southernmost portion of the range. All other portions of the Rifle range are undeveloped.
Current Human Receptors	Current human receptors include Navy personnel, contractors, and trespassers/visitors. Navy personnel and contractors may access the site to work at the wastewater treatment or aviation maintenance and repair facilities, or visit the recreational park. Trespassers/visitors may include personnel accessing the site from Pensacola Bay.
Current Activities (frequency, nature of activity)	Current activities for Navy personnel and/or contractors include those associated with the operation and use of the wastewater treatment and aviation and repair facilities, as well as routine grounds-keeping at the recreational park. Infrequent activities are expected by trespassers/visitors.
Potential Future Land Use	No change in land use is planned.
Potential Future Human Receptors	No potential for future human receptors is anticipated beyond the current receptors, as no change in land use is planned.
Potential Future Land Use Related Activities	Future land use related activities may include building or facility maintenance and repair, or utility modification.
Zoning/Land Use Restrictions	There are no zoning/land use restrictions at the Magazine Point Rifle Range.
Beneficial Resources	There are no beneficial resources located at the Magazine Point Rifle Range.
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (2000 Census).
Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	No documentation was identified describing the habitat type of the Magazine Point Rifle Range. Portions of the Rifle Range that are not developed are composed of heavily vegetated areas consisting of pines, vines, and small shrubs.

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Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Degree of Disturbance	The current and future land uses of the Magazine Point Rifle Range result in a moderate degree of disturbance to the habitat or ecological receptors.
Ecological Receptors	Terrestrial ecological receptors may include mammals (e.g., foxes, bears, and squirrels), reptiles (e.g., tortoises), terrestrial plants, and a variety of bird species. Aquatic ecological receptors in nearby surface water may include various species of fish, amphibians, and aquatic vegetation.
Relationship of MEC/MC Sources to Habitat and Potential Receptors	Ecological receptors can come into contact with MC through foraging and burrowing activities in surface soil. Additionally, aquatic ecological receptors may directly contact MC if present in the near-shore aquatic environment. Bioaccumulation of MC in plants and prey may also occur, resulting in food chain exposures to animals feeding in nearby waters or on the peninsula.

Graphical Presentations

The attached Munitions Characterization Map and Exposure Pathway Analysis Figure provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Historical and visual evidence indicate that MEC are not present at the site; therefore, there are no complete exposure pathways for MEC. As such, an Exposure Pathway Analysis Figure for MEC was not created. However, information obtained and visual observations indicate that the potential for MC exists.

The Exposure Pathway Analysis figure provides a summary of complete, potentially complete, and incomplete exposure pathways for MC. For MC, interaction between the source (e.g., the berm) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

MC Exposure and Pathway Analysis

The pathway analyses for MC at the Magazine Point Rifle Range are shown in Figure 5. Potential receptors include both human (Navy personnel, contractor, and trespasser/visitor) and ecological (biota)

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receptors that may come in contact with MC in the source medium or other potentially contaminated media from the site. Pathways are shown for each exposure medium and are discussed below.

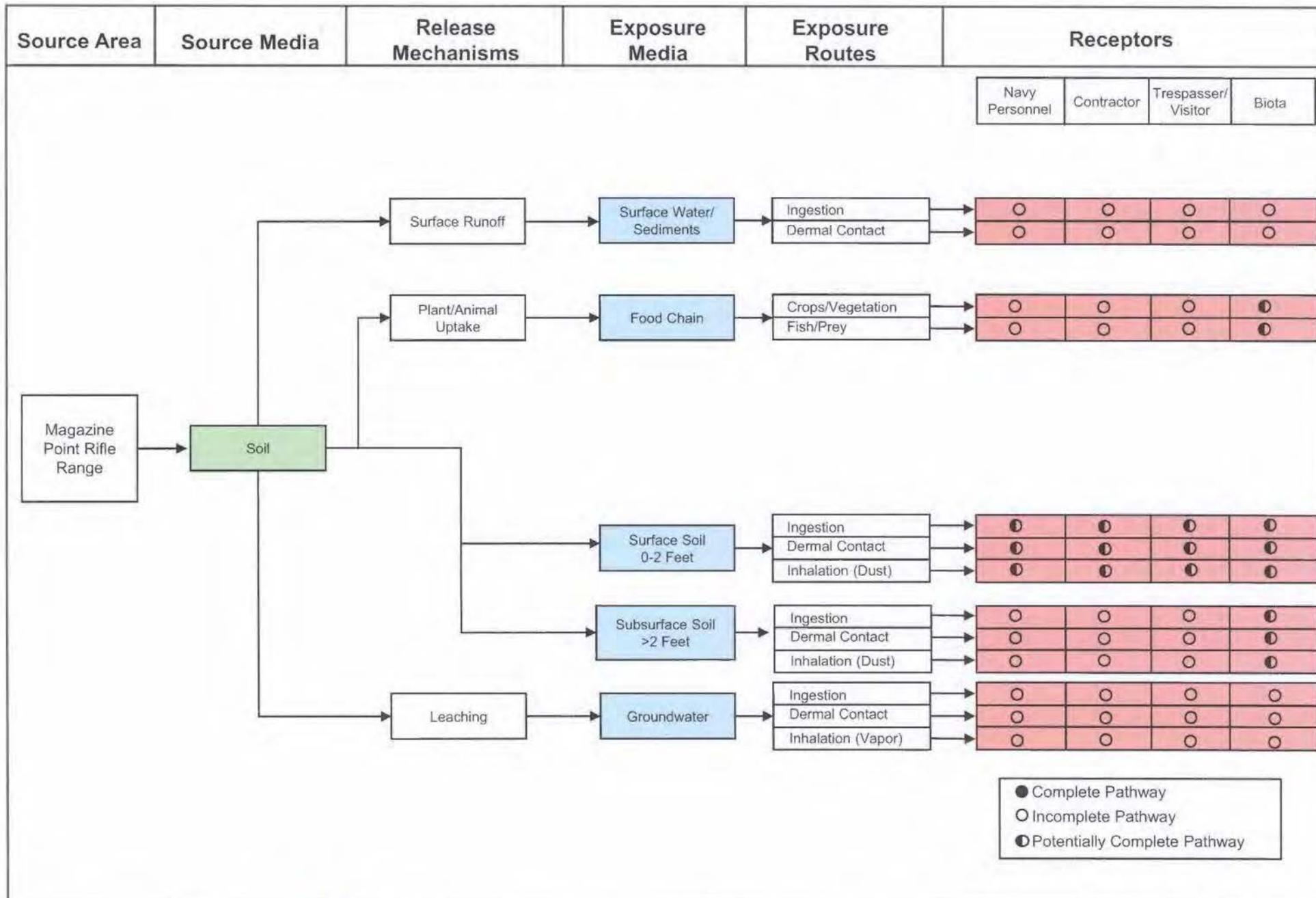
Surface Water/Sediment: MC may migrate from soil to surface water/sediment through surface water runoff. No surface water bodies exist at the site; therefore, there are no complete or potentially complete exposure pathways for any receptors.

Surface Soil (0-2 feet): MC may be present in surface soil from the bullets that were fired around and into the former Rifle Range berm. The berm was not observed during the site visit, and its disposition is unknown. Historically, when ranges were de-activated, it was common practice to spread the soil comprising the berm around the vicinity of the ranges. Potential receptors include Navy personnel and contractors of the wastewater treatment and aviation maintenance and repair facilities, trespassers/visitors accessing the site from Pensacola Bay, and biota that construct burrows or forage on the range. Potentially complete exposure pathways exist for these receptors via incidental ingestion, dermal contact, and inhalation.

Subsurface Soil (>2 feet): MC may be present in subsurface soil at the range due to migration from the overlying surface soil via leaching mechanisms. Biota may be exposed to MC in subsurface soil while constructing burrows; therefore, potentially complete exposure pathways exist for this receptor via incidental ingestion, dermal contact, and inhalation of dust caused by burrowing.

Groundwater: Depth to groundwater at the Magazine Point Rifle Range is approximately five to seven feet bgs. Because the depth to groundwater probably exceeds the depth to which biota would burrow on site, and because there are no human receptors identified for groundwater on or down-gradient of the site, exposure pathways are considered to be incomplete for all receptors.

Food Chain: MC in soil may accumulate in plants, which can subsequently be consumed by animals foraging on the site. Predation of prey and/or consumption of vegetation may result in bioaccumulation of MC. Potentially complete exposure pathways therefore exist for biota that may be exposed to MC through the food chain.



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MALCOLM
PIRNIE

Munitions Characterization
Magazine Point Rifle Range

Legend

- Installation Boundary
- Range/Site Boundary
- Surface Danger Zone
- Historical Site Features
- Firing Line
- Berm
- MEC Presence***
- Known
- Suspect

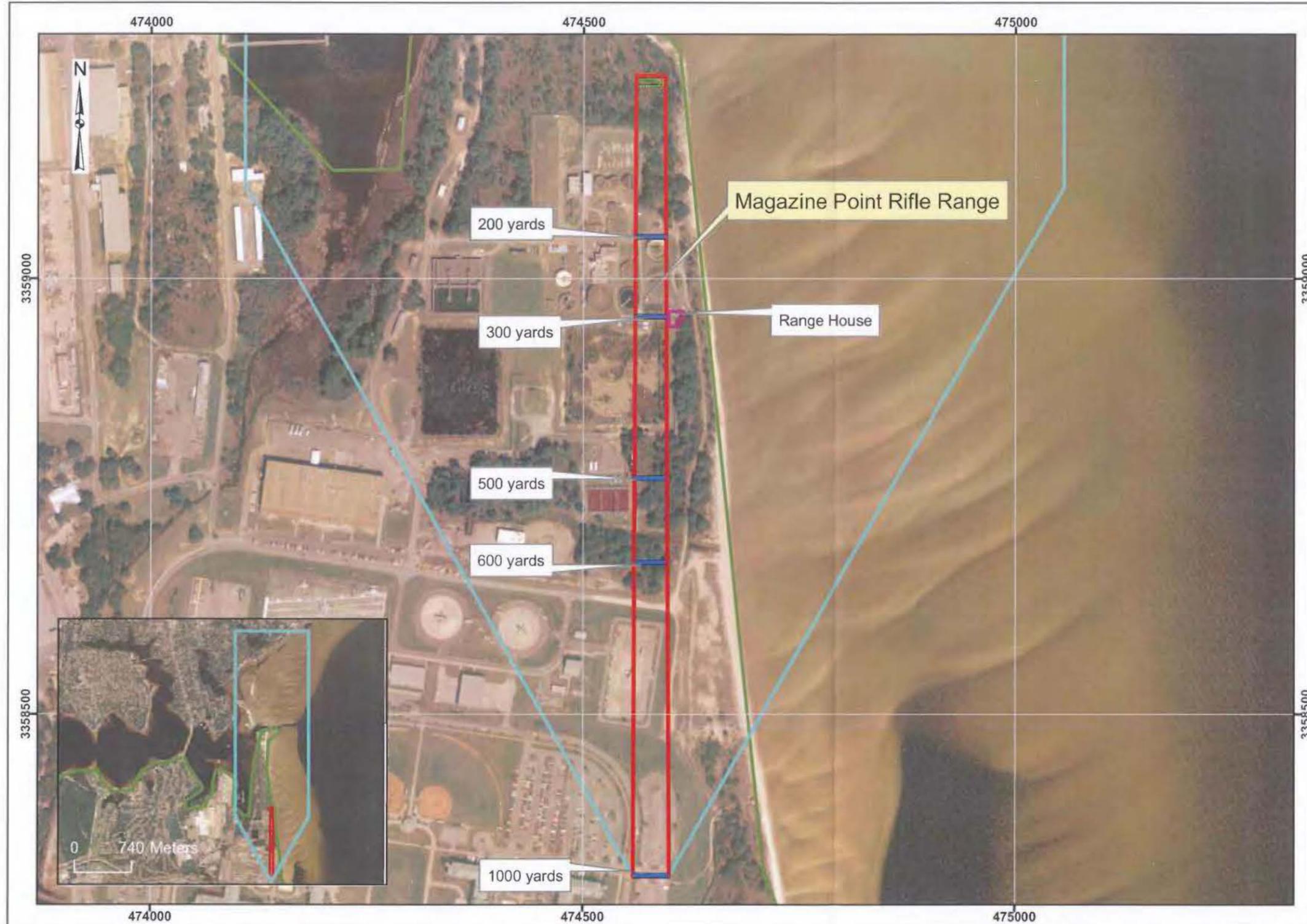
*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.



Data Source: NAS Pensacola, GIS Data, 2007
Map of US Navy Yard Pensacola, FL
Rifle Range, September 1910

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
Edition: Interim Conceptual Site Model
Date: July 2008



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Preface

This interim deliverable provides the Navy with a summary of information collected to date and the data sources used to support the Conceptual Site Model (CSM). It summarizes our current understanding of the site, presented in the attached Information Profiles. It also provides draft Graphical Presentations of the site layout and CSM. The Information Profiles and the Graphical Presentations will serve as the basis of the CSM section of the Preliminary Assessment (PA) Report.

This CSM focuses on the hazards and risks associated with munitions and explosives of concern (MEC) and munitions constituents (MC). The purpose of this interim CSM is to provide the Navy with preliminary results for comment before preparing the PA for the subject site. The CSM describes the site and its environmental setting based on existing knowledge, as well as sources, receptors, and the interactions that link them. It represents the best professional judgment of the investigator regarding the potential for explosive hazards and contamination to reach receptors, based on the likely MEC/MC present and the site environmental setting, migration pathways, and receptors. The CSM is a living model that is updated as additional information becomes available. The CSM is the basis for the risk evaluation and prioritization. Comments received on this document will be incorporated into the Draft PA Report.

Overview

Naval Air Station (NAS) Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation, while the remaining 2,623 acres are used for areas that include Naval Outlying Landing Field Bronson Field, Corry Station, Saufley Field, and the Lexington Terrace Housing (JLUS, 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east. The Bayou Grande bay intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field. NAS Pensacola is located where the former United States (U.S.) Navy Yard and Station was constructed in 1824, which was established to suppress the slave trade and piracy in the Gulf of Mexico and Caribbean Sea. The U.S. Navy Yard and Station was decommissioned in 1911, and NAS Pensacola was subsequently constructed in the vicinity in 1914. Upon its construction, NAS Pensacola was established as the world's first Naval Air Station and has since been referred to as "The Cradle of Naval Aviation." The current mission of NAS Pensacola is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NAS Pensacola include: Commander, Naval Education Training Command; Commander, Naval Air Technical Training Center; Naval Operational Medical Institute; and the Fleet Area Control and Surveillance Facility.

The Sherman Field Rifle Range is an approximately 21-acre area located south and slightly west of the western end of Sherman Field, within the boundaries of the main NAS Pensacola installation. Sherman Field was developed in the 1940s due to the advent of the jet age, when an airfield was needed that could handle the new high-speed aircraft like the F9F-6 Cougars and the TV2 Seastar. Sherman Field was built with longer runways for those aircraft, and was dedicated on November 2, 1951. The airfield was named

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after the late Admiral Forrest P. Sherman who was a former Chief of Naval Operations. The airfield is now the home of the Blue Angels and Training Air Wing SIX.



Figure 1: Aerial photograph of Sherman Field

The Sherman Field Rifle Range was identified on a 1951 "Jet Training Field Land Use Map." The range was not on a map dated January 1951 of land to be acquired in the area and it was not on a 1952 map showing the approach zones for Sherman Field, therefore the period of use of the range is approximately 1951. No additional archival records or references to the range were located, and no information regarding firing positions, munitions used, or construction details were identified. Direction of fire is assumed to be from the north-northeast to the south-southwest, based upon the map orientation and the surrounding development as depicted in the historical maps. Firing lines would have been located on the northern end of the range and the range probably had multiple firing points along its length. The location of the berm associated with the former range is unknown. The boundary of the site described in this ICSM is based on the range outline included on the 1951 map. The former fuel farm and the newly developed fuel farm are located just east of the approximate middle of the range, and Fuel Farm Road is located east of the fuel farm.

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Figure 2: Historical 1951 map showing rifle range

Data Sources

Archival Data Search:

- National Archives, Washington, D.C. and College Park, Maryland

Records Search:

- Navy Ordnance Safety and Security Activity Record Review
- Navy Range Inventory Database
- NAS Pensacola, Public Works/Environmental Department Records and Library
- National Museum of Naval Aviation
- Historical Map Files, Building 458

Personal Interviews:

- Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department
- Mr. Jim Kane, Deputy Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Steve Ward, Real Property Management, NAVFAC SE Public Works Department Pensacola
- Commander Kristine Nielsen, Public Works Officer, NAVFAC SE Public Works Department Pensacola
- Mr. Bill Taylor, NAVFAC SE Public Works Department Environmental
- Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE Public Works Department Pensacola
- Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc.
- Mr. Jeff Halstead, Exhibit Specialist, Fort Pickens State Park
- Mr. Dick Zani, Staff Specialist, Fort Pickens State Park

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- Ms. Debbie McKinley, Ordnance & Tech Services, United States Army Corps of Engineers, St. Louis District

Visual Survey:

A visual survey of the area around the Sherman Field Rifle Range was conducted on 2 April 2008 in a follow-up to the main site visit that occurred in November 2007. Malcolm Pirnie team members Ms. Angela Nolan and Mr. Dan Hains were present. The purpose of the visual survey was to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, or old targets), any evidence of MC (ground scarring, stressed vegetation, or chemical residue), or surface features that could provide additional information to aid in the characterization of the site. The site was bisected by various old roads in the area. Much of the area has a slash pine (*Pinus elliottii*) overstory and various native shrubs such as gallberry (*Ilex glabra*), bigleaf gallberry (*Ilex coriacea*), and saw palmetto (*Serenoa repens*) in the understory. Groundcover includes various native grasses. Sherman Field is located north of the site while Radford Boulevard is located south of the site. The fuel farm is located east of the site. The remaining surrounding area is undeveloped. No MEC, munitions debris, or bullets/bullet fragments were observed during the visual survey; however, the area of the former firing line and berm were inaccessible due to heavy vegetation.



Figure 3: View of vegetation south of Fuel Farm

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Figure 4: View of old fuel farm

Documents and Reports:

- Florida's Geological History and Geological Resources, Special Publication No. 35, Florida Geological Survey, 1994
- Florida Natural Areas Inventory Report for Emerald Coast Utility Authority and NAS Pensacola Force Main and Lift Stations. August 2007.
- Integrated Natural Resources Management Plan, Naval Air Station Pensacola, 2000-2010
- Results of the ECUA Beulah Constant Rate Aquifer Test, Sand-and-Gravel Aquifer, Escambia County Florida, Northwest Florida Water Management District, December 2001
- Escambia County Joint Land Use Study, Escambia County, Florida Growth Management Department, September 2003
- United States Department of Agriculture Soil Survey of Escambia County, Florida, 2004
- Public Health Assessment for Naval Air Station Pensacola, Pensacola, Florida, Agency for Toxic Substances and Disease Registry, 14 March 2006
- Site Assessment Report for Sherman Field Former Fuel Farm UST Site 000024, Naval Air Station Pensacola, 2002

Websites:

- www.naspensacola.navy.mil (Installation Information)

Maps:

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- Map of Jet Training Field, Fort Barrancas, Proposed Land Acquisition for Facilities and Approach Zone, 18 January 1951
- Map of Naval Air Station Pensacola, Florida, (Fort Barrancas), Jet Training Field Land Use Map, 1951
- Map of Naval Reservation Pensacola, Florida, Showing Conditions on June 30, 1950.

Historical records found at the National Archives for the Sherman Field Rifle Range included the 1951 map referenced above. No records pertaining to specific use or maintenance of the range were located. A Site Assessment Report (SAR) completed for the former fuel farm in 2002 was obtained on-base and includes information about the geology and hydrology of the area. Due to the age of the range and redevelopment of the site, interviews with Navy personnel provided no additional information about this range.

Information Profiles

Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Installation Name	NAS Pensacola
Installation Location	Escambia County, Florida
Range/Site Name	Sherman Field Rifle Range
Range/Site Location	Sherman Field Rifle Range is located southwest of Sherman Field within the main NAS Pensacola installation in Escambia County, Florida. It lies north of Big Lagoon, west of Pensacola Bay, and north of the Gulf of Mexico.
Range/Site History	The range was shown on a map dated 1951. No other information regarding the range history was available.
Range/Site Area and Layout	The Sherman Field Rifle Range is an approximately 21-acre site located southwest of Sherman Field, west of the Fuel Farm, and north of Radford Boulevard.
Range/Site Structures	The Fuel Farm buildings are located east of the approximate center of the site. No structures exist on the site.
Range/Site Boundaries	N: Sherman Field S: Undeveloped area and Radford Boulevard W: Undeveloped areas E: Fuel Farm and undeveloped areas

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Conceptual Site Model Information Profiles – Range/Site Profile	
Information Needs	Preliminary Information
Range/Site Security	A security check point must be passed to gain access to NAS Pensacola. Additionally, the area around the Fuel Farm requires access through a locked gate; therefore, access to the site is restricted from inside the installation to authorized personnel.

Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Munitions Types	Specific ordnance types used at the range were not identified; however, typical munitions used at a rifle range include .30 caliber rifle cartridges.
Maximum Probability Penetration Depth	The maximum penetration depth into the backstop berm is estimated to be 12 inches; however, the berm location is unknown and no berm was identified during the visual survey. If a berm had been removed, demolition of former ranges and site structures, along with construction and grading of former range areas, may have resulted in deposition of lead bullets and bullet fragments in the top one to two feet of soil at that area of the site.
MEC Density	Based on historical documentation, the Sherman Field Rifle Range was used only for small arms training. MEC are not suspected to be present at the site.
Munitions Debris	No evidence of munitions debris was identified during the visual survey.

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Conceptual Site Model Information Profiles – Munitions/Release Profile	
Information Needs	Preliminary Information
Associated Munitions Constituents	<p>The primary MC associated with small arms ammunition is lead. Other MC may include antimony, arsenic, copper, zinc and constituents associated with black and/or smokeless powder; however, these constituents are less likely to be of concern as they are either present in only minor concentrations or are typically consumed when the small arms ammunition is fired.</p> <p>Soil and groundwater sampling was performed at the Former Fuel Farm just east of the site as part of the 2002 Site Assessment Report (SAR). Petroleum constituents were present in the sampling and included benzene, ethylbenzene, total xylenes, 1, 2 methylnaphthalene, and Total Recoverable Petroleum Hydrocarbons. Several samples exceeded regulatory criteria. No information regarding metals was reported in the 2002 SAR.</p>
Migration Routes/Release Mechanisms	<p>Migration of MC from the Sherman Field Rifle Range may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake. Human activities including such as silviculture can cause MC migration. Future construction, excavation, or other site work could also serve as a migration/release mechanism.</p>

Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Climate	<p>The climate at NAS Pensacola is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricane Dennis in 2005.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Topography	<p>Sherman Field Rifle Range is located within the Gulf Coastal Lowlands which are generally characterized by poor drainage and elevations less than 40 feet above mean sea level on NAS Pensacola (INRMP, 2001). The Sherman Field Rifle Range area is a high area of the installation at approximately 25 feet in elevation and slopes towards Big Lagoon to the south.</p>
Geology	<p>The Sherman Field Rifle Range is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet below ground surface (bgs), and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).</p> <p>Specific information regarding the geology of this site is not known. Soil samples were analyzed at the Former Fuel Farm as part of the 2002 SAR for the former fuel farm. During that investigation, the lithology at that site was characterized as “yellowish brown to light brown to white, silty, fine to medium grained sand.” It also described the presence of a peat layer at 38 and 65 feet below ground surface (bgs).</p>
Soil	<p>Based on the U.S. Department of Agriculture Soil Survey for Escambia County, soils within the vicinity of these ranges include the Corolla, Kureb, and Newhan soil series of the coastal lowlands. These soils are generally sandy and vary from poorly- to well-drained (USDA, 2004).</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Hydrogeology	<p>The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands with varying percentages of clay. This aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) down to depths ranging from approximately 200 to 330 feet bgs (NFWWMD, 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area (NFWWMD, 2001). The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, for this investigation only the Sand-and-Gravel Aquifer will be discussed (NFWWMD, 2001).</p> <p>Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for NAS Pensacola is a well field located at Naval Technical Training Center (NTTC) Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola, which withdraws from the Sand-and-Gravel Aquifer (ATSDR, 2006).</p> <p>Depth to groundwater at the Sherman Field Rifle Range is not known since no sampling is known to have occurred there. Depth to groundwater measurements from the adjacent former fuel farm during the 2002 SAR indicated that groundwater ranges from approximately 7 to 24 feet bgs.</p>
Hydrology	<p>Extensive wetland areas are located south of the site near Radford Boulevard. Big Lagoon is located south of the site. Surface water runoff from the site drains directly into wetlands south of the site that flows into Big Lagoon.</p>

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Conceptual Site Model Information Profiles – Physical Profile	
Information Needs	Preliminary Information
Vegetation	Vegetation in the area consists of an overstory of slash pine trees. Shrub species include gallberry and big-leaf gallberry. Wetland areas scattered through the site and south of the area include sweetbay magnolia and other native species.

Conceptual Site Model Information Profiles – Land Use and Exposure Profile	
Information Needs	Preliminary Information
Current Land Use	Current land use of the Sherman Field Rifle Range is as an undeveloped area southwest of Sherman Field.
Current Human Receptors	Current human receptors include authorized Navy personnel, and contractors. Trespassers are unlikely to be able to access this site due to additional gates and fencing around the site.
Current Activities (frequency, nature of activity)	Current activities include silviculture.
Potential Future Land Use	No change in land use is planned.
Potential Future Human Receptors	Potential future human receptors are the same as the current receptors, as no change in land use is planned.
Potential Future Land Use Related Activities	No change in land use is planned.
Zoning/Land Use Restrictions	There are no known zoning/land use restrictions at the Sherman Field Rifle Range.
Beneficial Resources	Wetlands are located to the northwest and south of the site. Wetlands are present on the south end of the site. Additionally, according to a 2007 Florida Natural Areas Inventory (FNAI) report, state listed threatened or endangered plants may occur on the site including spoon-leaved sundew (<i>Drosera intermedia</i>), large-leaved jointweed (<i>Polygonella macrocarpa</i>), and white-topped pitcher plant (<i>Sarracenia leucophylla</i>). There are no other known beneficial resources located at the Sherman Field Rifle Range.
Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (U.S. Census, 2000). Approximately 14,720 civilian and military personnel are employed at NAS Pensacola (INRMP, 2001).

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Conceptual Site Model Information Profiles – Ecological Profile	
Information Needs	Preliminary Information
Habitat Type	Habitat for the Sherman Field Rifle Range is composed of slash pine forest with thick underbrush, and small shrubs. Shrub species include gallberry and big-leaf gallberry. Wetland areas scattered through the site and south of the area include sweetbay and other native species.
Degree of Disturbance	The current and future land uses of the Sherman Field Rifle Range result in a low degree of disturbance to the habitat or ecological receptors.
Ecological Receptors	Terrestrial ecological receptors may include mammals (e.g., foxes, bears, and squirrels), reptiles (e.g., tortoises), terrestrial plants, and a variety of bird species. Aquatic ecological receptors in nearby surface water may include various species of fish, amphibians, and aquatic/wetland vegetation. State listed threatened or endangered plants may occur on the site including spoon-leaved sundew (<i>Drosera intermedia</i>), large-leaved jointweed (<i>Polygonella macrocarpa</i>), and white-topped pitcher plant (<i>Sarracenia leucophylla</i>) (FNAI, 2007). No other threatened or endangered species are known to occur on or near the range.
Relationship of MEC/MC Sources to Habitat and Potential Receptors	Flora may bioaccumulate MC in surface and/or subsurface soil, via plant uptake. Fauna may be exposed to MC in surface soil through ingestion, dermal contact, and inhalation or by ingesting vegetation or prey organisms that may bioaccumulate MC.

Graphical Presentations

The attached Munitions Characterization Map and Exposure Pathway Analysis Figure provide a graphical representation of the current understanding of the site. The Munitions Characterization Map shows the boundaries of the site that are referenced in this Interim CSM and the physical features described in the Information Profiles. The illustrated boundaries help identify the receptors chosen for the Exposure Pathway Analysis. The Exposure Pathway Analysis identifies the exposure pathways through which site receptors could come in contact with or be impacted by MEC and/or MC. Historical and visual evidence indicate that MEC are not present at the site; therefore, there are no complete exposure pathways for MEC. As such, an Exposure Pathway Analysis Figure for MEC was not created. However, information obtained and visual observations indicate that the potential for MC exists.

The Exposure Pathway Analysis figure provides a summary of complete, potentially complete, and incomplete exposure pathways for MC. For MC, interaction between the source (e.g., the berm) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, leaching to groundwater), an exposure medium that contains the MC (e.g., soil, groundwater), and an exposure route

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(e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

MC Exposure and Pathway Analysis

The pathway analysis for MC is shown in Figure 5. Potential receptors include both human (Navy personnel and contractor) and ecological (biota) receptors that may come in contact with MC in the source medium or other potentially contaminated media from the site. Trespassers do not have access to the site due to additional fencing and gates within NAS Pensacola so all pathways involving the trespassers are incomplete for all exposure medium. Pathways are shown for each exposure medium and are discussed below.

Surface Water/Sediment: MC may migrate from soil to surface water/sediment through surface water runoff. The Sherman Field Rifle Range boundary extends over some wetland areas hydrologically connected to Big Lagoon. Additionally, the shallow groundwater present on the site may discharge to surface water such as wetlands within the area. Potential receptors include authorized Navy personnel and contractors working in the area along with aquatic and terrestrial biota that forage in the sediment and/or ingest surface water. Potentially complete exposure pathways exist for those receptors via incidental ingestion and dermal contact. MC in surface water/sediment may also bioaccumulate, and biota may be exposed to MC through the food chain. Potentially complete exposure pathways exist for all receptors via ingestion and dermal contact.

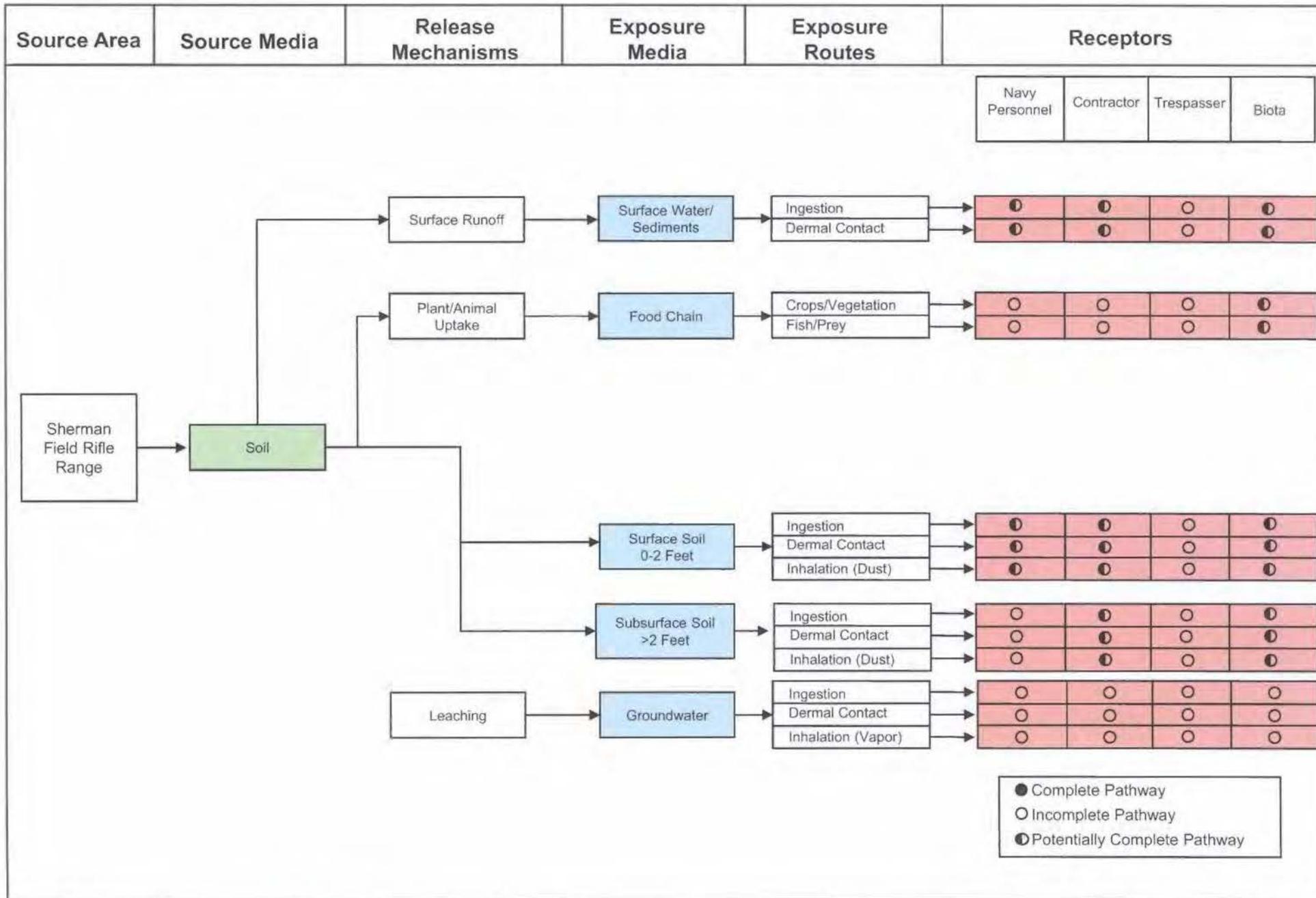
Surface Soil (0-2 feet): MC may be present in surface soil from the bullets that were fired around and into the berm. While the berm was not observed and may no longer be present, it is not known if the berm was removed. Potential receptors include authorized Navy personnel and contractors working in the area or involved with silviculture activities and biota that construct burrows or forage on the range. Due to vegetation and high precipitation in the area, inhalation is unlikely to be an exposure pathway for this site. Potentially complete exposure pathways exist for all receptors except trespassers via ingestion and dermal contact.

Subsurface Soil (>2 feet): MC may be present in subsurface soil at the range due to migration from the overlying surface soil via leaching mechanisms or due to disturbance from silviculture activities. Some biota (e.g., foxes) may also be exposed to MC in subsurface soil while constructing burrows. Contractors involved in silviculture activities may use earthmoving equipment around the site. Potentially complete exposure pathways, therefore, exist for these receptors via incidental ingestion, dermal contact, and inhalation of dust caused by earthmoving or soil excavation (including burrowing). Navy personnel are unlikely to come in contact with MC in the subsurface soil, since no intrusive activities at the range would be conducted by this group.

Groundwater: The depth to groundwater at the adjacent former fuel farm east of the Sherman Field Rifle Range is approximately 7 to 24 feet below ground surface. The depth to groundwater would make contact during site activities like silviculture unlikely. The main source of potable water for NAS Pensacola is a well field located at NTTC Corry Station, located to the north of Bayou Grande; therefore, water from the site would not be used for or effect drinking water. Therefore, groundwater exposure pathways are incomplete for all receptors.

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Food Chain: MC in soil may be bioaccumulated by plants or consumed by animals foraging on the range. Predation of prey and/or consumption of vegetation on the range may result in bioaccumulation of MC. Potentially complete exposure pathways are identified for biota who may be exposed to MC through the food chain.



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**MALCOLM
PIRNIE**

Munition Characterization
Sherman Field Rifle Range

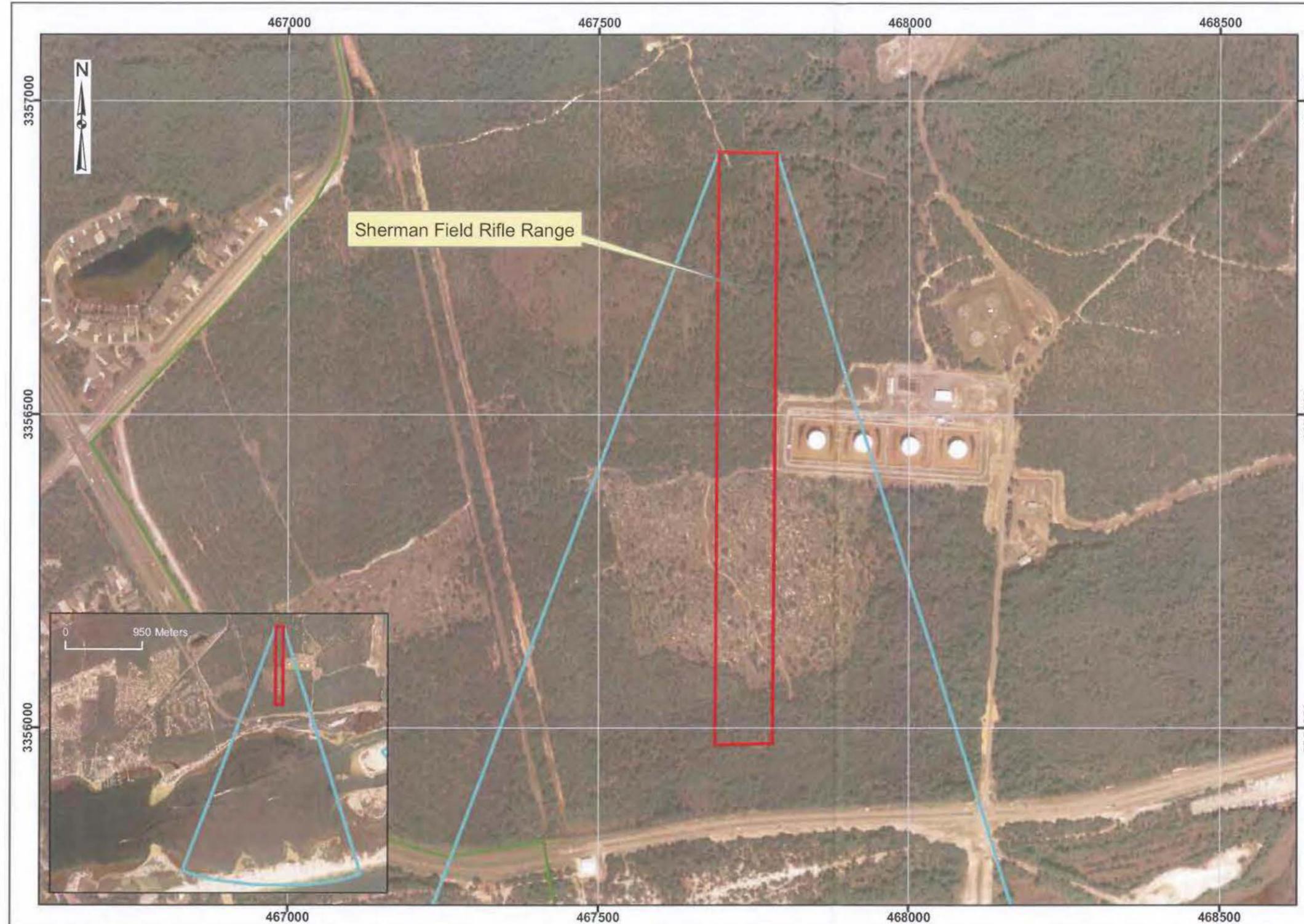
Legend

-  Installation Boundary
-  Range/Site Boundary
-  Surface Danger Zone

MEC Presence*

-  Known
-  Suspect

*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.



Data Source: NAS Pensacola, GIS Data, 2007
Naval Air Station, Pensacola, FL, Jet Training Field
Land Use Map, 1951

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: Meters

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